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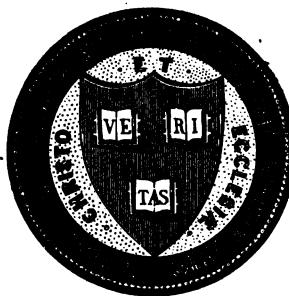
Compliments of

ADOLPH LEUE,

SECRETARY OHIO STATE FORESTY BUREAU,

CINCINNATI, OHIO.

~~For 15262~~

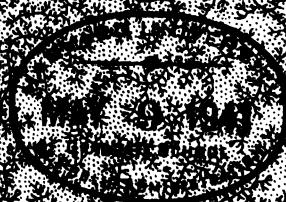


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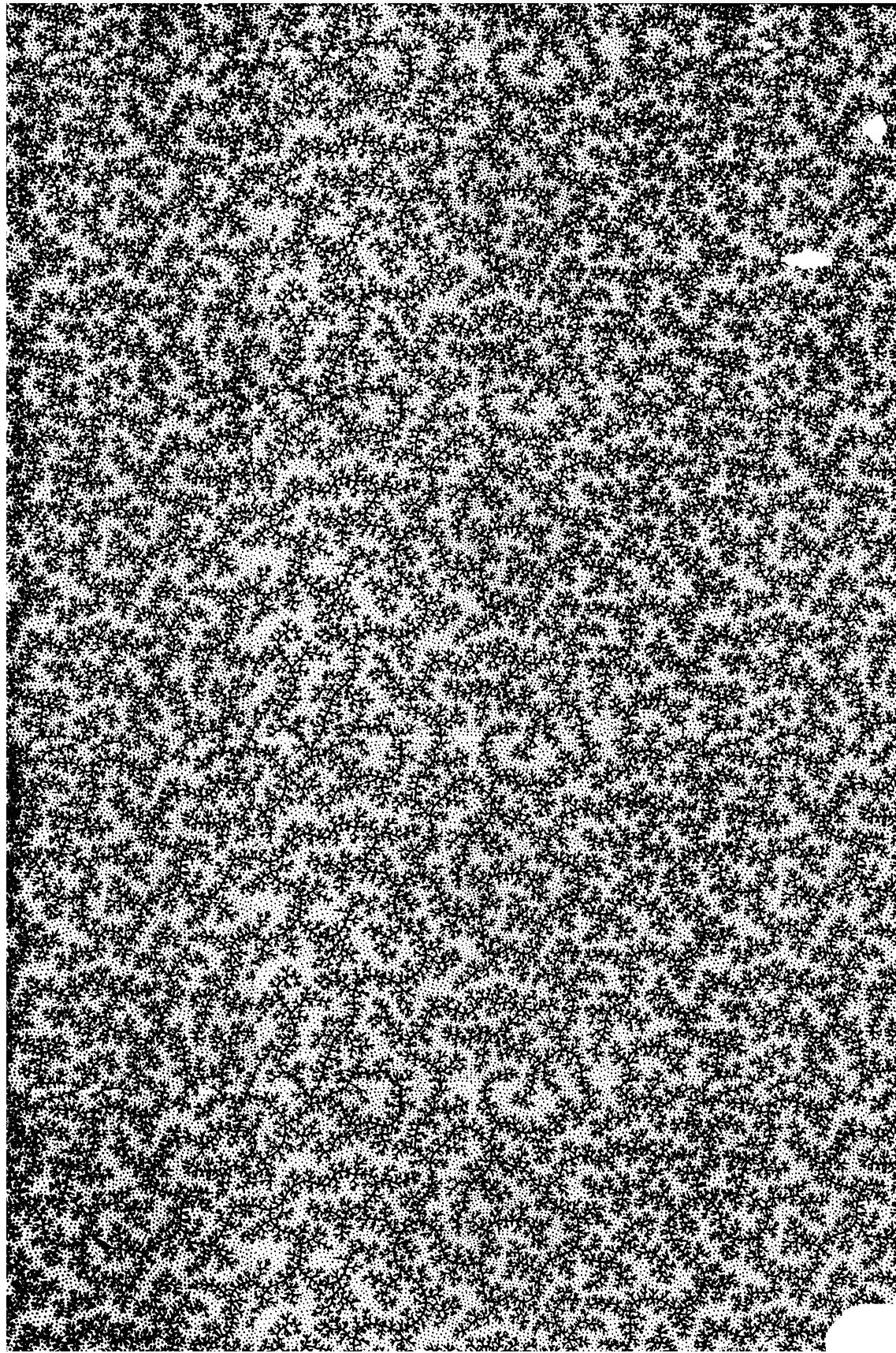
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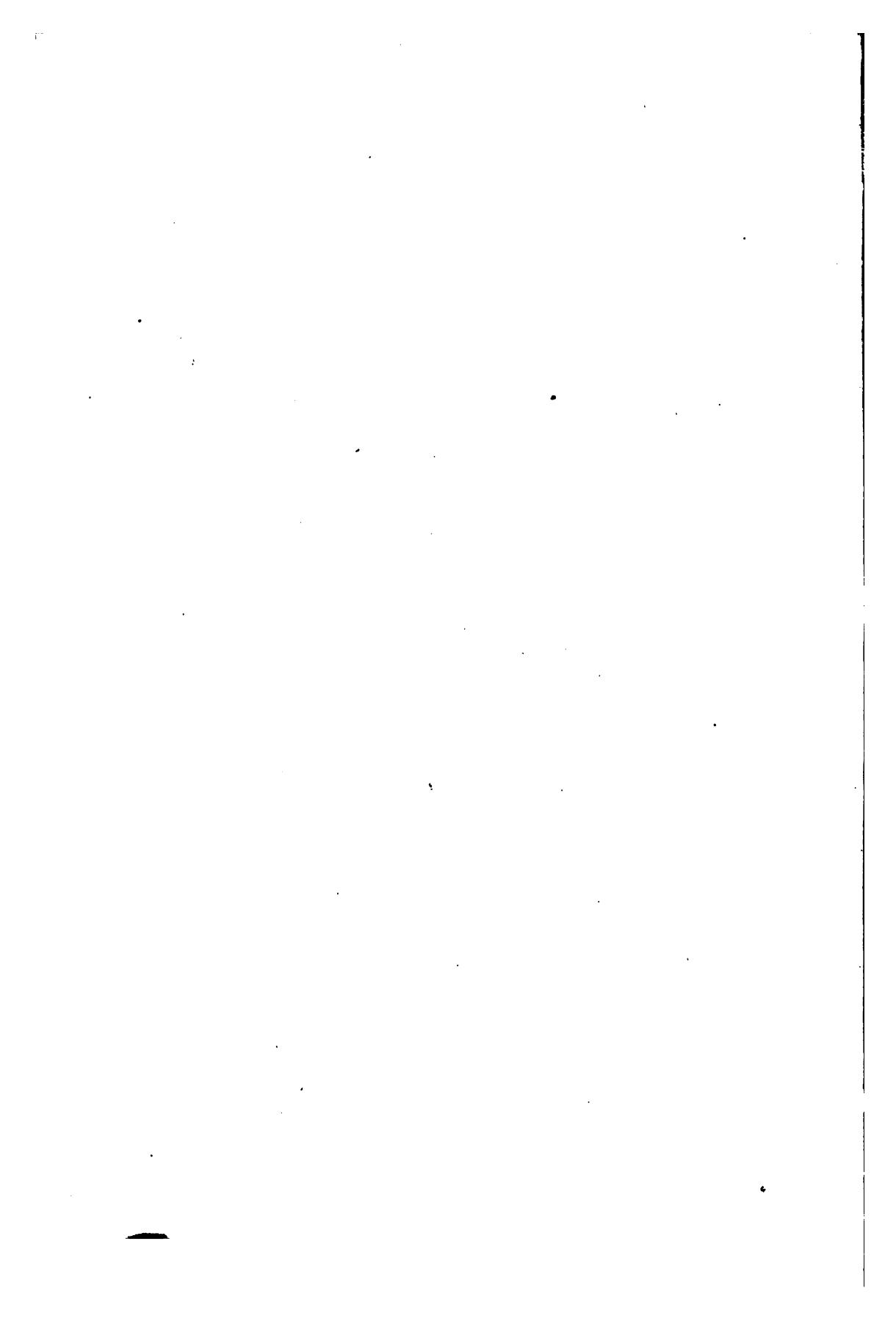
Adolph Leue,
Secretary.

6 Jan., 1890.



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FOURTH ANNUAL REPORT

OF THE

Ohio State Forestry Bureau,

TO THE

Governor of the State of Ohio,

FOR THE YEAR 1888.

BY ADOLPH LEUE, Secretary.

COLUMBUS:

THE WESTBOTE CO., STATE PRINTERS.

1889.

For 1536.3
~~V.3627~~



Adolph Leue,
Secretary



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BOARD OF DIRECTORS.

ORGANIZATION FOR 1889.

JOHN B. PEASLEE, Cincinnati.....	<i>President.</i>
JAMES POINDEXTER, Columbus.....	<i>Treasurer.</i>
ADOLPH LEUE, Cincinnati.....	<i>Secretary.</i>
LEO WELTZ, Wilmington.	

COLUMBUS, O., May, 1889.

To His Excellency, J. B. FORAKER, Governor of Ohio:

SIR: In accordance with section 3, of an act to establish a State Forestry Bureau, which act is as follows:

"This Bureau shall, annually, make a report to the Governor, which shall contain the results of the investigation, together with such other information as the Board may deem necessary for the promotion of forestry in this State," etc.—

We therefore present for your favorable consideration, such suggestions as we think may eventually lead to a perfect system of Forestry in our State.

The Legislature, according to section 2, gave permission, with the consent of the Trustees of the Ohio State University, to establish a Forestry Station at the University grounds, but we have been unable to receive any favorable reply to our requests soliciting the co-operation of the Trustees. We were therefore compelled to fall back on our own limited resources, adopting a resolution to establish one or more Forestry Stations in different counties of the State, so as to enable parties interested to cultivate and retain forests, and to encourage others by their works, as the Board intend to provide the different farmers with small seedling trees, to be planted and reared at such Stations, under the direction of this Board, which would enable us, with little outlay, to supply a long felt want.

However, a central Station would be the most desirable one, and to this end we would most earnestly pray for recommendations to the next Legislature the same as those asked in the last report.

Respectfully submitted.

LEO WELTZ,
President Ohio State Forestry Bureau.

TREASURER'S REPORT.

1888.		
April 20.	A. Leue, salary, Secretary, due February 1, 1888.....	\$100 00
20.	Robert Clark, binding report.....	45 05
May 2.	Jas. Poindexter, expenses.....	15 00
June 8.	Leo Weltz, expenses.....	24 00
	8. Henderson Achert, stationery.....	42 00
	8. J. B. Peaslee, expenses.....	2 25
Nov. 21.	Leo Weltz, postage and expenses.....	20 90
	21. Jas. Poindexter, expenses.....	5 00
26.	“ “	15 00
	28. A. Leue, salary and postage.....	310 00
Dec. 1.	Leo Weltz, expenses.....	12 63
13.	Jas. Poindexter, traveling expenses.....	45 68
19.	Leo Weltz, traveling expenses.....	56 90
1889.		
Jan. 16.	J. B. Peaslee, traveling expenses.....	12 00
16.	Leo Weltz, “ “	15 00
Feb. 14.	J. B. Peaslee, “ “	15 00
14.	Adolph Leue, “ “	15 00
14.	A. Leue, salary	100 00
14.	A. Leue, postage	9 00
14.	Leo Weltz, postage	15 00
	Total.....	\$873 41

JAMES POINDEXTER,
Treasurer O. S. F. B.

THE NECESSITY OF POPULAR AND SPECIAL EDUCATION IN FORESTRY.

An address read at the meeting of the Directors of the Ohio State Forestry Bureau, held at Columbus, Ohio, February 14, 1889, by ADOLPH LEUE, Secretary.

GENTLEMEN: From the very beginning of the forestry movement in Ohio, the great object of its promoters has been to furnish to the people of this great State, the much needed information in matters pertaining to forestry. In support of this assertion, we may well point to the proceedings of the Ohio State Forestry Association in 1884, and to the subsequent reports of this Bureau for 1885, 1886 and 1887, as well as to that of 1888, now ready for the press. We could also refer to the numerous letters of inquiry from farmers and manufacturers in various parts of the State, and by answering them, this Bureau has become a direct source of information for the individual.

When, therefore, Prof. Sargent said about Forestry Commissions,* that the field of their usefulness is limited, and their work must be advisory and educational, that they must become, if they are to justify their existence, the teachers of the people in all that relates to forests. He said nothing that is new to this Board. He demands of Forestry Commissions just what this Bureau has been doing during the past four years. In his subsequent remarks, he again corroborates the plans of this Bureau when he says: "The mental development which will make intelligent legislation upon such subjects possible, can only come after long years of discussion and education. In inaugurating such discussion, and stimulating such education, State Forestry Commissions will find their real and only field of usefulness, and failing in this, they will show their unfitness for existence."

The question, which agitates the minds of the friends of forestry in Ohio, is not *what are the needs of forestry*, but *how may the needs of forest be supplied most effectually?*

Although it is not expected, nor is it desirable, that all the people of Ohio should be expert foresters, yet every man in Ohio should know

* Garden and Forest, Vol. I, p. 385.

and understand the great importance of our forests to the future prosperity of our State.

We have thus before us two distinct objects:

1. The education of the people.
2. The education of professional foresters.

The means to be employed to attain these objects are also distinct.

1. *The education of the people in forestry.*

All laws which may be enacted for the promotion of forestry, and all efforts which may be made in its behalf, will avail but little, as long as the people are different or even averse toward the forestry movement; and they will remain to be so until they begin to feel and to understand the great importance of forests to the prosperity of our State and country. To hasten the time in which the necessity of due attention to forestry shall be recognized, a system of educating the people must be adopted, and the means devised.

One of the greatest and first wants of our people is: *Information respecting our native trees.*

The ignorance of our people in this respect is astoundingly great, not only among the people living in larger towns and cities, but even also among people living in the country. This need was very keenly felt by the late John A. Warder, who demanded that every child, and certainly every man, should be familiar with the appearance of forest-trees under all circumstances, in summer and in winter, standing erect or lying prostrate, in the log or in the lumber-pile, or when worked up into any of the secondary and ultimate forms to which trees may be applied. "We should," he said, "be able to recognize any of our trees by their several characters of trunk, branch, twig, foliage or buds and seeds; we should know them even at a distance, by their habit or form, their individuality. We should know the qualities and the uses of the timber, and other forest products yielded by our trees, including their strength, the density, pliability, elasticity and durability they possess as timbers, and their peculiar beauty as worked lumber, when needed for finishing and ornamentation."

Such a knowledge of our forest-trees should be brought within the reach of the people of our State through our public schools. To accomplish this, it will be necessary to make Forest Botany one of the branches of study in our Normal Schools, and to require all teachers of our public schools to be examined in the natural history of our forest-trees. With increasing intelligence and general information among the teachers in this, there can be no question that very much *may* be done, and *will* be done unofficially, to extend the knowledge regarding trees, among the people. Besides this, progressive teachers will soon find ways and means

to utilize his or her knowledge of forest-trees, either by making forest-trees the subject of compositions or of object lessons in the class-room. In the higher grades forest botany might very advantageously be made a regular branch of study.

Another great want of our people is:

Information respecting the friends and foes of the forest in the animal kingdom, or a general knowledge of forest zoology

This want also should be supplied by our public schools. Not only should this include the mammals and birds of the forest, but also the insect world. To successfully combat the foes of the forest, we should, above all, know them. Some of the most formidable foes of the forests are to be found in the insect world, as is so graphically described by Prof. William Saunders, of the Agricultural Experiment Station at Ottawa, Canada. "One of the influences which seriously affects the growth and preservation of forest-trees," he says,* "is insect pests. These creatures, often insignificant in size, make up in numbers what they lack in individual power, and frequently by their depredations cast the shadow of disappointment over the hopes and aspirations of the lover of forest-trees. These insidious foes sometimes attack the roots, feeding upon them, or boring into them, and thus sap the foundations of the tree's existence; they burrow under the bark, eating out channels or galleries, through the sap-wood, and materially interfere with the regular flow of the sap, or by the multiplication of these channels, sometimes girdle the tree and causes its death. Some of the tiny hosts attack the smoother bark of the twigs and branches, and puncturing their surface, suck the sap, the life-blood of the tree. Others burrow into the terminal shoots and cause their death; while a large army of invaders feed openly upon the leaves, consuming their substance, and materially retard the growth of the trees they attack."

In some instances we may, after we have recognized the enemies, by simple means destroy them, but more often our efforts will fail. All we can do in such cases, is to endeavor to aid nature in her efforts to restore the equilibrium, after which she is ever striving, by encouraging and protecting insect friends, or those which feed upon destructive species, and also insectivorous birds. We thus must know the friends of the forest as well as its foes.

As is the case of forest botany, so forest zoology should be made a branch of study in our Normal Schools, and teachers should be required to pass an examination in this science. A live teacher will have no trouble in finding opportunities to make use of the knowledge acquired in the preparation for examination. Forest zoology might become a distinct branch of study in the highest grades of our schools.

* Rep. of Fruit-Growers' Asso. of Ontario, 1882, p. 268.

The third great and popular want is:

Information in methods of planting, cultivating, and in the ultimate management of forests.

This great need will become apparent, when we look at the many failures in tree-planting, which are due to ignorance in the manipulation of planting.

This, too, is, paradoxical as it may seem, a subject to be taught in our public schools, not as a regular branch of study, but as an object lesson on ARBOR DAY. The planting of trees by children and teachers, who have no knowledge of, or experience in planting, is of a very doubtful value, and should be avoided. In such cases, school authorities should engage men, well acquainted with the manipulation of tree-planting, and cause them to do the work in the presence of teachers and pupils.

A law of Ohio, it is well known, directs that, wherever it is possible, shade and ornamental trees shall be planted in every school-yard. These trees will, from time to time, need trimming and pruning, which should always be done by one who understands it thoroughly, in the presence of teachers and pupils.

This may probably be the limit of teaching forestry in our district, intermediate and high schools.

Schools, however, are not the only channels through which to reach the general public. Equally powerful, and perhaps more so, is the Press, that great lever of modern civilization. The free use of the press, which, by courtesy of enlightened editors, the friends of forestry have had, has made it possible to unite the friends of forestry to concerted action, and to advance the cause to its present standpoint.

With these two great bulwarks of civilization, we need not entertain serious apprehensions regarding the final solution of the forestry problem of our land.

Quite distinct from this *elementary* instruction, or popular education in forestry is:

The Education of Professional Foresters

A professional forester should be well-trained in all the branches of mathematics; he should have a general knowledge of geology, geognosy, many, zoology, chemistry and physics.

In regard to the principal branches, or forestry proper, he should have thorough knowledge of—

1. Forest-botany, including the geographical distribution of forests and forest-trees.
2. Forest-zoology.

3. Cultivation of forests, from the gathering of the seed of forest-trees, to the harvesting of the mature forest-product. He should be acquainted with, and know how to handle all the improved implements used in practical forestry.
4. Forest protection.
5. Forest usufruct and forest technology.
6. Forest surveying.
7. Appraising of forests.
8. Forest laws, including hunting and game laws.
9. Forestry history, including forestal literature.
10. Forest statistics.

Under the pretense that there is as yet no need for professional or educated foresters in this country, agricultural colleges and universities are slow to provide for a course of instruction in the forestry science. That is, to say the least, a great mistake, and should be rectified.

If it be true, that as Dr. Felix L. Oswald says, "in an agricultural country, the preservation or destruction of forests must determine the decision of Hamlet's alternative, 'to be or not to be'"—and that "an animal flayed, or a tree stripped of its bark, does not perish more surely than a land deprived of its trees"—then the importance of a rational system of forestry for the protection of our agricultural interest must be admitted, and with it the propriety, yes, even the necessity, of teaching forestry science in our agricultural colleges.

The fact that popular education, of which I spoke in the beginning of this paper, is retarded by a lack of teachers competent to instruct in matters pertaining to forestry, also argues the necessity of providing for instruction of teachers in this science.

If, in addition to this, we take into consideration the purpose for which these agricultural and industrial schools were created, the failure to provide for the instruction in forestry in these institutions is inexcusable, or, as some writers have expressed it, a violation of the trust.

Nothing would serve the forestry interest of this State better than the addition of a Forestry Department in the Ohio State University. There is, indeed, no reason why such a department should not be created. Many of the branches to be taught in the forestry department are now taught in the University. The only additional expense would be the establishment of a chair in forestry. In consideration of the great importance of the subject, the General Assembly will, upon due presentation the necessity of this measure, not fail to make an additional appropriatio

CARRIAGE TIMBER, OR THE CARRIAGE MANUFACTURING INTEREST AND FORESTRY.

BY ADOLPH LEUE, CINCINNATI, OHIO,

Secretary State Forestry Bureau.

Of all the followers of the wood-working industries in this country, none have taken a deeper interest in forestry than the carriage-makers. In October, 1885, the executive committee of the Carriage Builders' National Association reported as follows: (1)

"The timber question has received some attention, but not what it deserves, and to-day we are ignorant of the possibilities of our timber supply. We know very little of the amount of timber standing, the length of time required to grow each kind, or the peculiar condition of soil and climate necessary to its cultivation."

In the discussion which followed, Mr. H. G. Shepard, of New Haven, Conn., said: (2)

"Perhaps you all know that the area of second-growth ash, first quality, is very limited; that there is a belt running from Vermont to Indiana; it includes the States of Vermont, Massachusetts, Connecticut, northern New York, northern Ohio and Indiana. Within this belt grows, I believe, nearly all our first quality second-growth ash. The supply in this territory is very limited. That which is good to-day, is almost impossible to reach; it is owned by old men, who are unwilling to have it cut off, and," he continued very gravely, "I am only waiting for them to die, that I may get hold of their ashes. * * * I would like to hear from others in regard to our timber supply, and for one, I am much interested in it, and should like to hear from any member who can give us any information in regard to it, especially good second-growth white ash."

Mr. G. H. Burrows, President Standard Wagon Company, Cincinnati, O., thought it well to memorialize the American Forestry Congress, and thus interest that body in the supply of wagon timber, especially as to quantities of Hickories, Ash and Oak, standing.

Mr. Fitzgerald, of New York, remarked:

did not intend to say anything on this subject, but owing to a step I have taken in connection with a paper a few months ago, I thought it would be well to mention it. I

have tried very hard for at least six months to get the expression of the manufacturers of timber, as to the supply of timber in their respective localities. To secure that, we sent out in the neighborhood of 300 circulars. Somewhere about fifty responded. Some who did not respond, by written letters afterward said: 'We did not dare to tell you what we had around our locality, fearing that some fellow would come and start a mill.' I found as near as I could, judging from the answers of these circulars, that none were satisfied with the quantity of timber in their respective localities, either in the South, North or West. They all seemed to fear that for any other man to come into their localities was to rob them of their supply.

"I wrote a letter to the Secretary of one of the Departments at Washington—I think it was the Secretary of the Interior—to procure the maps which were issued by the Census Bureau, by General Walker. I found that in soft timbers, in timbers where bark is used for tanning, and, in a measure, for white oak, the Government had issued a series of maps, in which the localities are colored, showing where the timbers grow, and giving something of a detailed account as to the quantities of each; but when it came to hickory and to ash and white-wood, or any other wood that is used more generally for the carriage trade, they made no mention of it. Following the matter up, I wanted to find what the effect would be, if this matter of export were carried on to the extent it now is, and I am surprised to find that the export of our hard timbers and white-wood, based upon the calculations made by men who understand our timber country, is sufficient in itself to exhaust all the supply of good timber during the next twenty years. I don't know what the carriage manufacturers are going to do. Canada should, however, supply us with certain kinds of timber that we cannot import, for our duties prevent. Our own forests are cut down very rapidly. In the western portion of North Carolina, eastern Kentucky and Tennessee and in Georgia, you will find a belt of hickory and white oak. Elsewhere it is scattering trees. I think if this Association would appoint a committee that could investigate this matter to ascertain the amount and come before the country with some prepared statement, based upon actual observation, we should be likely to reach a conclusion, which might not benefit the present generation of carriage-makers, but would benefit the future.

"All our supply of timber must be grown. There can be no controversy about that. We all understand that, and according to some people, who profess to know, we shall have to wait a good many years before we get a timber supply. If this Association is going to make itself felt, and for good, it can do it in this direction. We must do something to prevent our timber-supply from becoming exhausted."

On motion of Mr. Lowe Emerson, of Cincinnati, a committee was appointed to consider the question of timber supply, and what methods the Carriage Builders' National Association should adopt, not only to get statistics upon it, but to the area of the supply, to bring the matter to the attention of the Forestry Association, to secure maps, showing the various kinds of trees that are used for carriage-building, and the localities where they grow.

Now, in view of the fact, in Ohio, the manufacture of carriages is one of the most important industries in the State—for in this State alone more pleasure carriages are built each year, than are built in England, Scotland, Ireland, France and Germany together; no excuse is need for the Forestry Bureau to devote special attention to the relation of practical forestry to the carriage-making industry. The carriage-makers of Ohio will certainly see to it that the farmer or forester, who grow tre

used in the manufacture of carriages, will at all times find a good market for all the trees they can produce.

For the benefit of those who may intend to raise wagon or carriage timber, I append a list of trees growing in Ohio, the wood of which is reported as being used in the manufacture of carriages and wagons, with a description of the tree, its wood, and soil required for its growth, together with an enumeration of the uses to which it is applied in art and industry.

As a general rule, only four or five different kinds of woods are used in the construction of carriages and wagons, partly because these are well adapted to the purpose to which they are applied, and partly because they can be obtained more readily than others, and are consequently cheaper. With the decrease of the supply of those now mostly used, the necessity arises, to look to other kinds adapted for carriage manufacturing purposes.

OHIO TREES USED IN THE MANUFACTURE OF CARRIAGES AND WAGONS.

1. *Tulip tree.* (Yellow Poplar, Whitewood, Tulip Poplar.) *Liriodendron tulipifera, L.* This tree, which belongs to the Magnolia family, grows to a magnificent size, reaching the enormous height of 140 feet, (1) and its cylindrical trunk attains a diameter of about nine feet. In the open space, as in parks or the lawn, it assumes a beautiful, regularly conical form. Its yellowish green foliage is exceedingly handsome; its flowers resemble those of a tulip—hence the name of Tulip tree—its trunk, when young, is smooth, which never becomes very rough or jagged by age, and of a dark ash color. The bark of the roots and branches is bitter and aromatic. It prefers a deep, open soil, not necessarily rich.

The tree is readily propagated from seed, which should be sown in a fine soft mold, in a cool and shady place. If sown in the autumn when the seeds are ripe, it will germinate the next spring; but if sown in spring the seeds rarely sprout till the next year.

The general impression is, that the Tulip tree is rather difficult to transplant. Dr. F. B. Hough's advice, (2) to cut off the ends of the roots when it is taken from the seed-bed, and set in a new place, will prove fatal in most cases, unless the top be pruned at the same time.

E. S. Carman, in an article on the Tulip tree, (3) says that, contrary to the general opinion, this tree is not difficult to transplant, as he has seen hundreds of them removed from one place to another, with as little percentage of loss, as in the case of the Sugar Maple. To be successful transplanting the young Tulip tree, however, not only must the secon-

(1) Near Augusta, Ga., there is a Tulip tree 155 feet high, with a trunk of 9 feet in diameter, its best branches being 55 feet from the ground. This is said to be the largest tree in the South.

(2) Elements of Forestry, p. 251.

(3) The American Cultivator, 1880.

dary branches be cut back, but the entire stem to within two or three inches of the neck must be cut away, so that the roots and neck are all that remain to be transplanted.

As to rapidity of growth, it is remarked, that from roots thus transplanted from their native ground in early spring, trees not less than fifteen feet high can be counted upon in five years. Mr. Carman thus set one within twenty feet of the house, to produce a quick effect on a new place. Of results thus far, and under the unnatural treatment of pruning knife, this is given :

" The third year it had made a growth so considerable, that we were called upon to decide whether it should be cut back or removed, and the former alternative was adopted. It has been cut back yearly since, with the result that we prized it last summer as one of the most beautiful lawn trees we have ever yet set our eyes upon. The leaves are twice the size of those which grow in the woods, and are perceptibly larger than those which grow upon trees of the same age under cultivation when not cut back. Besides, annual pruning has forced the growth of many lateral buds, which would otherwise have remained dormant. So that the tree from spring to late in autumn, is a mass of luxuriant foliage, which entirely conceals the branches, and is most pleasing in its refreshing shade of green and firmness of texture during summer, and in its golden hues of fall. We are of those who believe that, as a rule, all pruning impairs, in a greater or less degree, the vigor or longevity of plants, though not, perhaps, appreciably so in many cases. How long our Tulip tree will remain healthy under this treatment, remains to be seen. We are impressed, however, that the development of several branches by pruning, in place of one branch when the tree is permitted to grow naturally, may change its size from one of the first magnitude with an erect columnar trunk, to one of comparatively dwarf dimension; in other words, that the vigor which, in the woods, is expended in the growth of a colossal main stem, is by cutting back, distributed among the greatly increased number of lateral branches and leaves."

Wood-workers recognize three varieties, namely : The *white*, the *blue*, and the *yellow*. These are, however, not distinguishable by any external signs of the tree. The difference in the color of the wood is attributed to the nature of the soil on which they grow.

The wood (1) is light, soft, not strong, brittle, very close, straight grained, compact, easily worked, medullary rays numerous, not prominent; color light-yellow, or brown, the thin sap-wood, nearly white; specific gravity, 0.4230, ash, 0.23; largely manufactured into lumber, and u

for construction, interior finish (¹) shingles, in boat-building, and especially in the manufacture of wooden pumps, wooden-ware, and carriage building.

Mr. James R. Gilmore (Edmund Kirke), of Knoxville, Tennessee, writing to the Cincinnati Commercial (Aug. 5, 1881), about the timber resources of Tennessee, says of the use of the Tulip tree, that in most sections of that State this wood is used as a substitute for pine. It is made into joists, studding, rafters, weather-boarding and shingles; and, in fact, is applied to about every use that white pine is put to at the North. But, while more durable than that wood, it is liable to swell and shrink, with the alternation of the weather. It is this wood which will come into universal in-door use, when the Michigan forests are exhausted.

2. *Linden*. (Basswood Lynn, Linn, Lime tree, Whitewood.) *Tilia Americana*, *Linnæus*. This tree is regarded as one of the finest shade and ornamental trees in this country. It attains a height of about eighty feet, and a trunk of from two to three feet in diameter. Mr. Brown, in his "Trees of America," describes this tree as follows:

"Its body is straight, uniform, and surmounted with an ample and tufted summit. In winter it is readily recognized by the robust appearance of its trunk and branches, and by the dark-brown color of the bark on the shoots. The leaves are from three to four inches wide, obliquely heart-shaped at the base, abruptly and acutely pointed at the summit, finely and sharply toothed, glabrous above, of a deep green, and paler beneath, with foot-stalks about two inches long. The flowers, which appear in June, are about half an inch in diameter, borne by pedicels from four to six inches long, and are garnished with a long, narrow floral leaf. The cymes are compound, having from twelve to eighteen flowers, pendulous and sub-divided at the extremities. The sepals are triangular-lanceolate, pubescent outside and wooly within. The petals are longer than the sepals, and are of a yellowish-white. The staminodia are obovate-lanceolate, exactly like the petals, but smaller. The style is sometimes longer, and at others shorter than the petals, and hairy towards the base. The fruit, which ripens in September and October, is about the size of a pea, nearly round, and covered with a short gray pubescence, usually perfecting but one seed."

The wood is light, soft, not strong, very close-grained, compact, easily worked; medullary rays numerous, rather obscure; color, light-brown, or often slightly tinged with red; the sap-wood hardly distinguishable; specific gravity, 0.4525; ash, 0.55. [U. S. Cens. Report, 1880.]

The basswood is, on account of its great toughness, invaluable to the carriage-builder. Besides its lightness and easiness to work, it possesses the valuable property of retaining any shape required and given, by the lager, and for bodies and panels of carriages and sleighs, it is unsurpassed. It is also extensively used in the manufacture of wooden-ware and cheap furniture, and preferred by sculptors for carving of statuary.

¹) The boards have the reputation of possessing unusual resonance, and have been used to line great Music Hall of Cincinnati. Formerly it was much used for the finishing of houses, before railroads and canals furnished transportation for the white pine lumber. [Dr. Warder.]

As fuel, it is of very little value. It is, however, preferred to most of the soft wood, for the manufacture of charcoal. The inner bark or bast is extensively used in the manufacture of coarse cordage and mats.

The flowers of the Linden are very rich in honey, which is said to be superior to that of any other flower. Apiarists recommend the planting of the tree for honey.

Valuable as the tree is, it will never be a predominant tree in the forests of the future, because of the great abundance of its foliage, and the large area a single tree needs for development. For these very reasons it will probably become the favorite for planting on streets and roadsides. Massachusetts avenue in Washington, D. C., is, on account of its rows of Linden trees, as famous for its grandeur and beauty, as Unter der Linden in Berlin, Prussia's capital.

About the propagation of this tree, Hunter, the editor of *Evelya*, says: ⁽¹⁾

"The seeds being ripe in October, let a dry day be made choice of for gathering them. As these grow at the extremity of the branches, it would be tedious to gather them with the hand; they may, therefore, be beaten down by a long pole, having a large winnowing sheet, or some such thing spread under the tree to receive them. When you have got a sufficient quantity, spread them in a dry place for a few days, then, having procured a spot of rich garden ground, and having the mold made fine by digging and raking, let it be raked out of the beds about an inch deep. These beds may be four feet wide, and the alleys a foot and a half. After the mold is raked out, the earth should be gently tapped down with the back of the spade, to make it level. Then the seeds should be sown at about an inch asunder, all over the bed, gently pressing them down and covering them about an inch deep. In the spring of the year, the young plants will make their appearance; when they should be constantly kept clean from weeds, and gently watered in very dry weather. In this seminary they may stand for two years, when they will be fit to plant in the nursery; at which time they should be carefully taken up, their roots shortened, and the young side branches, if they have shot out any, taken off. They must be planted in the nursery ground in rows, two feet and a half asunder, and one foot and a half distant in the rows. There they may stand, till they are of proper size to be planted out for good, observing always to dig between the rows every winter, and constantly to keep the ground free from weeds."

Again, the same authority says:

"When the layering of these is to be performed, which ought to be in the autumn, the strong two-years' shoots must be brought down; and if they are stiff and do not bend readily they must have a gentle splash with the knife near the bottom; a slit should be made at the joint for every one of the youngest twigs, and their ends bent backwards, that the slit may be kept open. This being done, the mold must be leveled among the layers, and the ends of them taken off to within one eye of the ground. The business is then done; and the autumn following they all will have good roots, many of them will be strong and fit to be planted out for good, whilst the weakest may be removed into the nursery ground in rows to gain strength."

Another method of propagating this tree is planting of shoots. If a old linden in the forest be cut down close to the ground numerous shoot

⁽¹⁾ Quoted by Emerson, in *Trees of Massachusetts*.

will come up near the stump ; these should be covered at the base with soil. In two or three years they will have sufficient roots, that they may be taken up and transplanted into permanent locations.

The white Basswood or Wahoo (*Tilia heterophylla*) is used for similar purposes, and may be propagated in the same manner as the *Tilia Americana*.

3. *Honey Locust*. (Black Locust, Three Thorned Acecia, Sweet Locust, Honey Shucks, Gleditschia.) *Gleditschia triacanthos*, *Linnæus*. (1) This valuable, but not sufficiently appreciated tree, which, in some localities, is also called Black Locust, wood-workers often confounded with the Black or Yellow Locust, (*Robinea pseudacacia*, Linn, which belongs to the same family.

The wood of this tree is heavy, hard, strong, coarse-grained, moderately compact, durable, susceptible of a high polish ; layers of annual growth strongly marked by many rows of open ducts ; medullary rays numerous, conspicuous ; color, bright, brown or red, the sap-wood lighter ; specific gravity 0,6740 ; ash, 0.80 ; used for fence-posts and rails, wagon hubs, construction, etc. ; it presents a good appearance, when dressed and treated with oil, as inside finish for houses.

I have in my collection of forest-products a hub of the wood of this tree, made about eighteen years ago, which served as a showpiece in Cincinnati for sixteen years, standing on the sidewalk on Central Avenue, near Everett street, day and night, winter and summer, exposed to rain and sunshine, to frost and all the changes of our climate, and yet it is as sound to-day as it was when first placed there.

4. *Dog-wood* (Flowering Dog-wood,) Boxwood, *Cornus Florida*, *Linnæus*. This tree, which is very common in our forests, has not received the attention of foresters to which the great beauty of its flowers and the value of its wood for economic purposes entitle it. On account of its slow growth and small size, (it attains a height of 20 to 30 feet, with a trunk of from 8 to 12 inches in diameter,) it is not adapted to enter largely into forest plantation, but it might well find a place in the borders of groves and forests. The white flowers of this tree, which expand in May, add very considerably to the attractions of woodlands in spring and early summer. Its leaves, too, are exceedingly beautiful, when late in summer they change from a luxuriant green to a purple, and then turn to a rich ured or crimson above, with a light russet beneath. Scarcely less beautiful is its fruit, which is of a bright scarlet, with a dark purple calyx, ripe August.

(1) For a description of this tree, mode of cultivation, etc., the reader is referred to the article *Locust*, by Prof. J. L. Budd, in III Annual Report, Ohio State Forestry Bureau, pp. 71 & 72.

Loudon says (1) of this tree: "it is universally allowed to be the handsomest species of the genus. It thrives best in peat soil, which must be kept moist, and the situation should be sheltered, though the foliage of the plants must be fully exposed to the influence of the sun, otherwise they will not flower." It may be propagated from seeds or by cuttings or layers. (2)

The wood is heavy, hard, strong, close-grained, tough, checking badly in drying, satiny, susceptible of a beautiful polish; medullary rays numerous, conspicuous; color, brown, changing in different specimens to shades of green and red, the sap-wood lighter; specific gravity, 0.8153; ash, 0.67. [Sargent.]

It enters largely into the construction of many articles, both for utility and ornament. It is used in turnery, for wood engravings and the bearings of machinery, hubs of wheels, barrel hoops, for handles of light tools, mallets, toys, etc. Of late it has been used (by Mr. Shaefer, of Stryker, O.,) in the manufacture of oars, excellent samples of which were seen in the Forestry Department of the Ohio Exhibit, Centennial Exposition, Cincinnati, 1888, now in my forestal collection. It is sometimes used by farmers for harrow teeth, for hames, and also for shoeing the runners of sleds. On account of its proneness to split, the wood should be perfectly seasoned before using it for any of the above mentioned purposes. The shoots, when three or four years old, are well adapted for being made into light hoops of small casks.

5. *Black Gum* (Tupelo, Peperidge, Sour Gum,) *Nyssa sylvatica*, Marshall. This tree, which belongs to the Order of Cornaceæ, or Dogwood family, is generally distributed on flat, wet lands; its realm extends from Massachusetts to Illinois, and from thence south to the Gulf of Mexico. It attains a height of from 30 to 80 feet, with a trunk of from 1 to 3 feet in diameter. Of this tree Dr. Warder says:

"When exposed it assumes a handsome, regular conical form; the branches, horizontal, are pending with layers of bright, shining, deep-green leaves, that change to brilliant crimson. This change often begins with a spray, or single branch, at midsummer, long before the access of frost."

This tree should be more used in landscape gardening. In clearing an old wood, preserve the gums. If they have naked shafts their beauty may be restored in a few years by cutting off the tops severely. The tree is well named the "Nymph of the Woods."

(1) Loudon's Encyclopedia of Trees and Shrubs, p. 507.

(2) The seeds of the Dogwood requires from 2 to 3 years to germinate, but Michaux gives the following method: Gather the seeds in fall, clean them of their pulpy covering by rubbing them in water, cover them with earth in a box and place them in the cellar till spring, care being taken to keep the earth moist.

It blooms early in spring, and its flowers are quite fragrant. Seed, a berry, small, and of a blue color.

This tree is generally raised from seeds, which do not sprout until the second year. It is difficult to transplant, especially from the woods.

The wood is heavy, rather soft, strong, very tough, unwedgeable, difficult to work, inclined to check unless carefully seasoned, not durable in contact with the soil, containing numerous, regularly distributed, small open ducts; medullary rays numerous, thin; color, light yellow, or often nearly white, the sapwood hardly distinguishable; specific gravity, 0.6353; ash, 0.52.

The wood and its uses is graphically described by a recent writer as follows: (1)

"Its grain is so interwoven that I am afraid even the patience of Job, famed in Biblical history, would give way under such a task, and he would fall from grace, or, in other words, he would swear, had he been compelled to cut some of the black gum. It is held in high estimation for wagon hubs, rollers and cylinders; it is also fit for turning-work, and, to my notion, would make first-class ornamental work, as the glue-pot would not have to come into requisition so often to glue together some of the parts of our furniture."

It is excellently adapted and greatly used for ox-yokes, hatters' blocks, etc.

6. *Persimmon*. (Date-Plum Persimmon) *Diospyrus Virginica*, *Linnaeus*. This tree differs very greatly in size; in its northern limits it attains a height of about 20 feet, while in the South it occasionally measures 60 feet, with a trunk about 2 feet in diameter. In Ohio it attains a height of about 40 feet, and its trunk from 8 to 15 inches in diameter.

Common in central and southern Ohio. Foliage, smooth and handsome. Flowers, heath-like and fragrant. Fruit, a berry, which, when ripe, is sweet and luscious, matures on different trees from September to December, and varies greatly in form, size, and color.

The seed might be planted in autumn, after it is ripe. If planting is to be deferred till spring, it is best to let the seed remain in the berry. Plant in the seed-bed, and transplant the seedling when one year old.

"Wood heavy, hard, strong, very close-grained, compact, susceptible of a high polish, containing few scattered open ducts, the rings of annual growth marked by one or more rows of similar ducts; medullary rays numerous, conspicuous; color, dark brown, often nearly black, the thin p-wood, light brown, after, containing numerous darker spots; specific gravity of the sap-wood, 0.7908; ash, 0.96; used in turnery for shoe-tops, plane stocks, etc., and preferred for shuttles; the dark heartwood only developed in very old specimens and rarely seen." [Sargent.]

(1) Gen. James S. Brisbin, U. S. A., "TREES AND TREE-PLANTING." (New York; Harper & Bros.), p. 136.

The wood of this tree is also much used in place of Ash, as axle-trees for carriages and wagons.

White Ash. (1) *Fraxinus Americana*, Linnæus. This is one of the most valuable trees, not only of those in this country, but of all the trees on our globe. It is indigenous in the New England States, and thence it extends westward through the States of New York, Pennsylvania, Ohio, Indiana, Illinois, Minnesota and Iowa, and south to northern Florida, Alabama and Mississippi, and according to Gen. Brisbin, it grows to a small extent in Southern Kansas, but he says, "is so small and crooked that it is worthless except for fuel." It is found in low, rich, rather moist soil, and according to Prof. Sargent, reaches its greatest development in the bottom lands of the lower Ohio River basin.

To successfully and profitably grow this tree it should be planted in a moist, cool and deep soil, where it will grow rapidly. Those which are of rapid growth are known to furnish the best timber, while those of slow growth, are generally weak and brittle.

The seed should be gathered when ripe, which in this State is about the first of October, and may be planted at once. If, however, planting is deferred till spring, it is well to mix the seed with moist sand, which will prevent it from becoming dry. Seed of the Ash that has been dried will not come up. "In planting the Ash, with a view to the production of timber," says Mr. Bryant, "it is necessary to grow the trees thickly while young, that they may be drawn up with a clear, straight stem, without large side branches. When of proper size the trees may be taken from the seed-bed and planted in rows four feet apart, and two feet apart in the rows. When transplanted the trees should be trimmed to a single straight stem, and as they grow it will be proper to see that they do not fork, and shorten or remove any side branches that take too much of the growth of the main stem. Trees set at the specified distance will probably not need thinning till they are large enough for hoop-poles. The thinning must be continued as the growth of the trees require it. From three to four hundred trees are probably as many as can be grown to maturity upon an acre."

The tree attains a height of from seventy to one hundred feet, with a trunk of three to five, occasionally six feet in diameter. The "wood is heavy, hard, strong, ultimately brittle, coarse-grained, compact, layers of annual growth clearly marked by several rows of large open ducts, ¹ pitting in slowly-grown specimens, nearly the entire width of the annual rings; medullary rays numerous, obscure; color, brown; the sap-

(1) For further information on this and the other American species of the Ash, the reader is referred to the admirable paper on the Ash, by the late Arthur Bryant, in *II Annual Report of the State Forestry Bureau*, pp. 191-195.

much lighter, after nearly white; specific gravity, 0.6543; ash, 0.42; largely used in the manufacture of agricultural implements, carriages, handles, oars, etc., in house building and cabinet-work." [Sargent.]

The adaptedness of this wood in the manufacture of carriages was beautifully illustrated in the Forestry Department of the Ohio exhibit by numerous pieces of bent-work, of Ohio White Ash wood, kindly furnished by Mr. G. H. Shepard & Sons, New Haven, Conn. Besides parts of carriages made of this wood, there was an involute, showing the possibilities of wood-bending, a wood chain consisting of three links, each about 18 inches in diameter. These two articles were objects of great interest in the department. In addition to this, there were several pieces of white ash wood, split and twisted to show the great toughness of the wood, two pieces of Ohio White Ash and one of White Ash grown in Connecticut, showing the comparative toughness. All of these objects, with the exception of the involute and the chain, are now in my collection.

8. *Red Ash.* *Fraxinus pubescens*, Lamark. The range of this tree is about co-extensive with that of the White Ash, and requires about the same kind of soil, but does not grow to the same proportions. It rarely exceeds the height of seventy feet, and its trunk a diameter of two feet.

Prof. Sargent describes the wood as "heavy, hard, strong, brittle, coarse-grained, compact; medullary rays numerous, thin; color, rich brown; the sap-wood light-brown, streaked with yellow; specific gravity, 0.6251; ash, 0.26; specific gravity of the light sap-wood, 0.5609; somewhat used as a substitute for the more valuable White Ash, with which it is often confounded."

It might be cultivated in the manner of the White Ash, but being inferior in quality, its culture for the production of timber is hardly advisable.

9. *Green Ash.* *Fraxinus viridis*, Michaux. This tree, near streams, delights, like the two last, in a low, rather moist soil. It extends further west than either the *White* and the *Red Ash*, and seems to be capable of enduring greater cold than the White Ash. It is a smaller tree, attaining a height of only 30 to 40 feet, with a trunk of one to two feet in diameter.

The wood is described as heavy, hard, strong, brittle, rather coarse-grained, compact, satiny, containing numerous scattered small open ducts, the layers of annual growth marked by several rows of large ducts; medullary rays numerous, small, obscure; color, brown; the sap-wood lighter; specific gravity, 0.7117; ash, 0.65; inferior in quality, although used as a substitute for White Ash.

It may be cultivated like the White Ash. Its clean foliage and size fit it to the streets of towns, and to roadside planting. It is easy to propagate, and grows rapidly.

10. *Blue Ash.* *Fraxinus quadrangulata, Michaux.* This tree extends its natural range from Southern Michigan to Central Minnesota, south to Northern Alabama, and through Iowa and Missouri to Northeastern Arkansas. It occurs more frequently in Southwestern Ohio than in other portions of the State; it thrives best on limestone hills, and is rarely found in the bottoms. It attains a height of sixty to ninety feet, with a trunk of about two feet in diameter. From the quadrangular shape of the young branches, it received its species name *quadrangulata*.

"Wood heavy, hard, not strong, brittle, close-grained, compact, satiny; layers of annual growth clearly marked by one to three rows of large open ducts; medullary rays numerous, obscure; color, light-yellow, streaked with brown; the sap-wood light; specific gravity, 0.7184; ash, 0.78; largely used in flooring and carriage building."—[Sargent.]

This is a very desirable species to be grown, for the wood of the Blue Ash, it is claimed, is not inferior to that of any other species in the qualities which characterize the genus, and possesses the advantage of greater durability.

It may be raised from seed in like manner as the White Ash, but should be planted in rich limestone soil.

11. *Red Elm.* (Slippery Elm, Moose Elm.) *Ulmus fulva, Michaux.* This tree is widely distributed. Its range extends from the valley of the Lower St. Lawrence River, westward to Ontario and Northern Dakota, and south to the Chattahoochee region of Northern Florida, Central Alabama and Mississippi, and the Valley of the San Antonio River in Texas. It grows best on borders of streams, or rich lands and hillsides, attaining a height of fifty to seventy feet, with a trunk of one to two feet in diameter.

Wood heavy, hard, strong, very close-grained, compact, durable in contact with the ground, splitting readily when green; layers of annual growth clearly marked by several rows of large open ducts; medullary rays numerous, thin; color, dark-brown or red; the thin sap-wood, lighter; specific gravity, 0.6956; ash, 0.83."—[Sargent.]

Wood is largely used for wagon and carriage-hubs. Also for fence-posts and railway ties, for which latter two purposes it is not well adapted, as it is liable to rot when in contact with the ground. "As a shade-tree," says General Brisbin, "it is splendid, and grows rapidly. Trees of this kind planted in 1861, grew to be twelve inches in diameter in ten years.

The seeds, which ripen in the early part of June, should be gathered by hand before they drop, as, from their lightness and winged appendages, they are very apt to be blown away by the wind. The seeds may be sown as soon as gathered; they will come up in the same season, or they may be spread out to dry in the shade, and then be kept in bags or boxes.

stored away in a dry place till spring; to be sown in seed-beds as soon as the soil can be worked. After one season's growth the seedlings should be transplanted into nursery rows.

12. *White Elm*. (American Elm, Water Elm.) *Ulmus Americana*, *Linnæus*. The realm of this tree is even greater than that of the Red Elm, as it extends further north and west. It is found in all parts of the State on wet flats. "This tree," says Dr. Warder, "is large and umbrageous, and well adapted for grand avenues, but too great for crowded streets in towns. Michaux called this the grandest vegetable in America, but the early pioneers did not esteem it highly, because they could not split the logs, and, when sawed, the lumber would spring, and was prone to decay, hence the trees were girdled and left to decay." Almost all writers on American trees commend it for its grandeur and beauty. Prof. N. H. Egleston (¹) speaks of it thus: "As a single tree on the lawn, or by the side of a wide road, where it has room in which to spread and to develop its true character, we have no tree among the broad-leaved or deciduous species equal to it in combined grandeur and beauty. And so it has been a favorite tree for planting by the roadside, dividing favor in this respect, with the Maple alone. It reaches its best development along the river valleys of the Middle States and New England. No one, who has seen the Elms of the Connecticut Valley at Northampton or Deerfield, or who has walked under the over-arching Elms of Temple street and Hillhouse avenue, New Haven, will ever expect to see anything finer in tree-form, or wonder that a city, which has the honor of being the seat of Yale College, should also be called the 'Elm City.'"

It is a large tree, attaining a height of from ninety to one hundred and ten feet, with a trunk of from five to eight feet in diameter. It may be cultivated from seeds in the same manner as the Red Elm.

Its wood is described by Prof. Sargent as: "Heavy, hard, strong, tough, rather coarse-grained, compact, difficult to split; layers of annual growth clearly marked by several rows of large open ducts; medullary rays numerous, thin; color, light-brown, the sap-wood somewhat lighter; specific gravity, 0.6506; ash, 0.80."

Largely used for hubs of wheels, saddle-trees, hames, flooring, and in cooperage. It is also much used in boat and sleigh-building, and for this purpose largely exported to England. Quite a number of hubs of various sizes, made of this tree, were on exhibit in the Forestry Department of the Centennial Exposition in Cincinnati. Especially interesting was the series of hubs in the various stages of manufacture presented by the Royer Wheel Company, of Cincinnati, and a large hub from the Standard Wagon Company, of Cincinnati.

(1) *Hand-book of Tree-planting*, (Appleton & Co., New York, 1888) p. 66.

13. *Rock Elm.* (Cork Elm, Hickory Elm, Cliff Elm.) *Ulmus racemosa, Thomas.* This tree is not as widely distributed as the other elms. It is found in Southwestern Vermont, west through Western New York, Ontario, and Southern Michigan, to Northeastern Iowa, and south through Ohio and Central Kentucky. It is a large and very valuable tree, generally found on low and wet clay, rich uplands and rocky declivities, reaching its greatest development in Southern Ontario and the southern peninsula of Michigan; height, seventy to one hundred feet; diameter of trunk, two to three feet.

"The wood is heavy, hard, very strong, tough, very close-grained, compact, susceptible of a beautiful polish, layers of annual growth marked with one or two rows of small open ducts; medullary rays numerous, obscure; color, light clear-brown, often tinged with red, the thick sap-wood much lighter; specific gravity, 0.7263; ash, 0.60. Largely used in the manufacture of heavy agricultural implements, wheel stock, and for railway ties, bridge timbers, sills, etc." [Sargent.]

14. *Wahoo or Winged Elm.* *Ulmus alata, Michx.* This tree is southern, but has been cultivated in Ohio. It prefers a dry, gravelly soil. It attains a height of thirty to forty feet, and its trunk a diameter of one to two feet.

"Wood heavy, hard, not strong, very close-grained, compact, un-wedgeable, medullary rays distant, not conspicuous; color, brown, the sap-wood lighter; specific gravity, 0.7491; ash, 0.99; largely used for hubs, blocks, etc." [Sargent.]

15. *Osage Orange.* (Bois D'Ark). *Maclura aurantiaca, Nuttall.* A southwestern tree, planted in Ohio chiefly for hedging. It reaches its greatest development along the valley of the Red River in the Indian Territory, where it attains a height of fifty to sixty feet, with a trunk of about two feet in diameter.

Wood heavy, exceedingly hard, very strong, flexible, close-grained, compact; very durable in contact with the ground, satiny, susceptible of a beautiful polish, containing numerous small open ducts, layers of annual growth clearly marked by broad bands of larger ducts; medullary rays thin, numerous, conspicuous; color, bright orange, turning brown with exposure, the sap-wood light yellow; specific gravity, 0.7736; ash, 0.68; largely used for fence-posts, paving-blocks, railway-ties, and wheel-stock. The Osage Indians make their bows of it.

I have in my collection a hub turned by the Royer Wheel Company, of Cincinnati, out of a limb of an Osage Orange tree, which grew on the farm of Mr. A. L. Frazer, near Mulberry, Clermont county, O. The tree, from which this limb was taken, stood in a neglected Osage Orange hedge,

planted about 25 years ago, was about 30 feet high, with a trunk about one foot in diameter.

An Osage Orange coppice would no doubt pay well. General James S. Brisbin, U. S. A., says: (1) "In a few years a plantation of Osage Orange trees would reproduce itself. It is so frequent with suckers, that, like the chestnut, the more it is cut down the more shoots it will throw out, and thus the Osage plantation will grow thicker and thicker."

In Ohio, this tree has, as far as could be ascertained, been grown as a hedge-plant only, and the grown specimens met with in various parts of the State are mostly found in neglected hedges.

Although Osage Orange seed may be obtained from trees growing in this State, it is generally considered best to buy Southern seed. "In purchasing this article," says Dr. Warder, (2) "care should be taken that it be fresh, and that its vitality be perfect. Good seed is heavy and bright, and should give the sensation of coldness to the hand, when immersed into it. When crushed, it should have a plump, white kernel, and should not have a rancid flavor."

The seeds when dried and ready for the market weigh thirty-five pounds to the bushel. If carefully kept they retain vitality, or germinating power, for two years, but require a little more care in germinating them.

Several methods of treating the seed to insure germinating, or sprouting, are recommended. On this subject Dr. Warder says: (3) "The first object, before planting, should be to scald it, by pouring upon it boiling water, which should be drained off, and the seed is to be then kept covered snugly, until it has swollen, and is ready to sprout; this will require about a week, more or less, according to the temperature. While it is in this state it should be frequently stirred, to prevent fermentation, which would be apt to commence in a large mass of wet seed."

Another method: "About the first of March, wet the seed by putting them in soak, and letting them remain about forty-eight hours, after which they are to be spread, not more than six inches in depth, in some cool place, secure from mice, and kept moist by spreading over them wet sacks or moss in sufficient quantity to confine the moisture, but not so much as to cause danger of heating or fermentation. Keep them in this state until they commence sprouting, when they should be sown imme-

tely. Seeds received too late for the above process may be sprouted wetting frequently in warm water, pouring the same off immediately. a few days, if the weather is warm, they will commence sprouting. The

1) *Trees and Tree-planting*, by James S. Brisbin, U. S. A. (Harper and Brothers; New York,

2) *Hedges and Evergreens*, p. 53.
Hedges and Evergreens, pp. 57-58.

water used may be near the boiling point, but will answer just as well at a temperature of 100 degrees.” .

C. R. Overman thinks that the most effectual way to prepare the seed for vegetating is, to soak it forty-eight hours in warm water (about the close of winter), and then expose it to hard freezing. Once or twice is sufficient, but care must be taken to spread it out so that all parts may be frozen alike. After this the seed must be kept moist and cool as possible, to prevent sprouting too early, or before the ground or the weather is in proper condition for planting. If seeds are much sprouted before planting, the roots will be crooked. After being frozen, the surest way to keep the seed right is to put it into an ice-house, and keep it there till within a week of time you wish to plant. It may, however, be kept in any cool or shaded place, protected from mice and kept moist.

The method of sprouting seed without the freezing process is given by Dr. Warder, as follows: “Put the seed in a vessel and cover it with water as warm as you can bear to your hand. Keep the vessel near the stove, change the water once a day, and soak the seeds about five days, after which pour off the water, and keep the vessel covered with a damp cloth. The seed should not go more than four or five inches deep in the vessel, as in this condition they are liable to heat if kept too much in bulk. Stir occasionally, and in about a week more, if kept in a warm room, they will begin to start, and should be planted before a fourth of them sprout.”

In regard to planting, many methods have been proposed, but the following given by Dr. Warder, seems preferable:

“The seed having been prepared, and the ground rendered mellow by thorough tillage, and of all things, the weather being mild and pleasant, say, in this latitude, about the 1st to the 15th of May, we may proceed to planting or sowing the seed, which should be done as follows: With a line stretched across the plot selected, shallow furrows are to be made with a hoe, as for planting peas or beans. These rows may be 18 to 24 inches apart, or more, so as to admit of horse-tillage during the summer. In these drills the seeds are to be thickly and evenly strewn, so as to lie about an inch apart, and immediately covered with a little fine earth drawn up over them in a decided ridge, that shall bury them about two or three inches deep, according to the condition of the soil, as to dampness, and according to the dryness of the weather; shallow if there be a prospect of rain, and deeper if threatened with drought. If you have access to a drill-barrow, that is adapted to seed of this size, use it by all means as a labor-saving engine of great importance, and enabling you to distribute the seed with much more regularity than can be done by hand.

“The object of throwing up a ridge over the seed is twofold; it shows you the precise position the young plants are to occupy; and, secondly, it enables you to pass along, just before they emerge, and remove the crust of earth which is apt to form after rain, and with it destroy the first crop of young weeds; this is done with a light garden-rake, and it is a very important aid to the starting of the young plants, in their first efforts to make their struggles in the battle of life, especially if the seeds have been intrusted to a clayey soil. Those who attempt to grow the maclura from seed, in stiff clay soils, will experience great difficulty in getting the young plants above the surface, unless they pay particular attention to these directions; such soils will bake and form a resisting crust, that will prevent most of the young plants from emerging; and in such a soil you will also find the weeds very

troublesome; whereas, by a light raking down of the little ridge, the crust and an infinite number of weeds, are early destroyed, and the young seedlings are not only freed from hindrance, but are really accelerated in their growth by the culture thus applied."

"*Nursery Culture.* The treatment of the young plants, after having watched them safely emerged from the soil, and after having relieved them from the crust that sometimes forms upon the surface, will consist in setting them up if prostrated by storms, the occasional stirring of the soil, and the destruction of weeds. This may be done by horse-cultivators and by hand-hoeing.

"The young seedlings will continue to grow until late in the season, and in the autumn will not have ripened their wood, but will frequently be covered with a soft green foliage, when their growth is checked by the frost. Soon after this occurs they must be cut off near the ground, either with a brush-scythe, or better, with a mowing-machine; after which a furrow is opened near the outside rows, and the next passage of a sharp plow will throw the plants out with the furrow. Boys then gather up the plants and tie them in bundles of one hundred—using a willow or packing-yarn."

To successfully preserve the young plants during the winter, they may be "heeled in," or placed in moderately damp earth in the cellar. In large quantities, they may be staked up loosely in the field, with alternate layers of earth, and covered over with dirt—the object being simply to keep them in a moderately moist state, rather to prevent their exposure and drying than to exclude the frost, which is not injurious, except when the roots are exposed to air and sunshine.

As soon as the weather permits and the soil can be worked, the seedlings may be planted and cultivated in the manner in which black locusts (*Robinia pseudacacia*) are planted and cultivated.

16. *Shell-bark Hickory.* (*Shag-bark Hickory.*) *Carya alba*, Nuttall. "This emblematic tree of America," says Gen. Brisbin, "and the representative of the character of one of our greatest men, will always be a favorite with our people, not only on account of its history, but its valuable nut-bearing qualities and its wood."

This tree has a very wide range, extending from the valley of the St. Lawrence river westward along the northern shore of lakes Ontario and Erie to Southern Michigan and South-eastern Minnesota, thence south to the Chatachoochie region of Western Florida, Central Alabama and Mississippi, and thence west to Eastern Kansas, the Indian Territory and Eastern Texas. It thrives best on rich hillsides and sandy ridges, and reaches its greatest development west of the Allegheny Mountains. It is met with in almost all parts of the State, but most abundant on the flat lands of Central Ohio. It grows to a height of 80 to 100 feet, with a trunk of 3 to 4 feet in diameter.

The "wood is heavy, very hard and strong, tough, close-grained, compact, flexible; layers of annual growth clearly marked with one to three rows of large open ducts; medullary rays numerous, thin; color, brown, the thin and more valuable sap-wood nearly white; specific gravity, .8372; ash, 0.73." [Sargent.]

Next to the Ash it is the most valuable of wood in carriage building, in the manufacture of agricultural implements, ax-handles, baskets, and for other mechanical purposes. As fuel this wood is considered to be the best. The bark, which separates in long strips, is useful in tanning and used in medicine. Hickories, like walnuts, may be raised in seed-beds, and thence transplanted into nursery-rows, or the nuts may be planted where the trees are destined to grow. Loudon says: "When propagated, the nuts should, if possible, be planted where the trees are intended to remain, as most of the species have very long tap-roots, which are nearly destitute of fibres. This remark, however, does not apply to *Carya amara*, which, like *Juglans nigra* (Black Walnut), has an abundance of fibrous roots." The prevailing opinion now, however, is, that with sufficient care, all the nut-bearing trees may be transplanted successfully. According to the immediate object in view the method of culture should vary. If planted for fruit, *i. e.*, for nuts, it is advisable to let the seedlings remain in the nursery till two or three years old, and when transplanted should be set apart about four feet each way, that the tree may spread out its branches, and then they should be thinned to keep the branches from touching. To make the tree bear early, it is recommended to dig under the tree and cut the tap-root as close to the surface as possible. If the raising of timber be the object, the seedlings should be set into deep holes, that the tap-root may be put in perfectly straight. To insure a straight and rapid upward growth, and to facilitate cultivation, the seedlings should be planted in rows four feet apart and two feet apart in the row. When the young trees are large enough for hoop-poles they should be thinned out by removing every alternate tree in the row. About five years after the first thinning, again thin out by cutting every alternate tree. At a third thinning every alternate row may be removed.

The adaptedness of young hickory wood for various purposes and the constantly increasing demand upon such timber by the various industries, make a dull market for this forest-product impossible. There is, on the contrary, every prospect for a good return on money invested in this peculiar branch of forestry.

These remarks on the culture of the Shell-bark hickory apply also to the other species of this genus.

17. *Big Shell-bark Hickory.* (Bottom Shell-bark, Thick Shell-bark.) *Carya sulcata.* This tree, which closely resembles the former, is rather rare and local. It is reported to be indigenous from Chester county, Pa., west to Southern Indiana and Illinois, Eastern Kansas and the Indian Territory, and rather generally distributed in Ohio. It develops best on rich lands near rivers, where it attains a height of from eighty to one hundred feet, with a trunk of two to four feet in diameter.

Wood is heavy, very hard, strong and tough, very close-grained, compact, flexible, layers of annual growth marked by one or two rows of large open ducts; medullary rays numerous, obscure; color, dark-brown, the sap-wood nearly white; specific gravity, 0.8108; ash, 0.90; used for the same purpose as the Shell-bark Hickory. The large nuts are sweet and edible.

18. *Mocker Nut.* (Black Hickory, Bull Nut, Big-bud Hickory, White-heart Hickory, King Nut.) *Carya tomentosa*, Nuttall. This is, without doubt, the most widely distributed species of the hickories, being indigenous in all that portion of the country, from the valley of the St. Lawrence River, Northern Shores of Lakes Ontario and Erie, to Eastern Nebraska, Eastern Kansas, and the Indian Territory, south to Cape Canaveral and Tampa Bay, Florida, and the valley of the Brazos River, Texas. Its favorite localities are rich upland hill-sides. It is a fine tree, attaining a height of sixty to ninety feet, with a trunk of three to four feet in diameter. Of all hickories, this is said to be of the slowest growth.

Wood heavy, very hard, strong, tough, very close-grained, checking in drying, flexible, containing few large, distributed open ducts; medullary rays numerous, thin, obscure; color, rich dark-brown, the thick sap-wood nearly white; specific gravity, 0.8216; ash, 1.06; used for the same purpose as that of the Shell-bark Hickory.

19. *Pig-nut Hickory.* (Black Hickory, Brown Hickory.) *Carya porcina*, Nuttall. A very widely distributed tree on dry hills and uplands. Attaining a height of sixty to eighty feet, with a trunk three to four feet in diameter.

Wood heavy, hard, very strong and tough, flexible, closed-grained, checking in drying, containing many large open ducts; color, dark or light-brown, the thick sap-wood lighter, often nearly white; specific gravity, 0.8217; ash, 0.99; used for the same purposes as that of other hickories, but preferred wherever great strength is required.

20. *Bitter Nut.* (Swamp Hickory, Brown Hickory.) *Carya amara*, Nuttall. This tree has, like most other hickories, a very wide range, extending from Southern Maine westward to Nebraska and Kansas, and south to Western Florida and to the valley of the Trinity River, Texas. Very prolific on the Ohio River hills, where it reaches a height of from fifty to eighty feet, with a trunk two to three feet in diameter.

Wood heavy, very hard, strong, tough, close-grained, checking in drying, layers of annual growth marked by several rows of large open ducts; medullary rays numerous, obscure; color, dark-brown, the sap-wood, light-brown, or often nearly white; specific gravity, 0.7552; ash, 103. Used for hoops, ox-yokes, and in the manufacture of carriages.

Wood-specimens, *i. e.*, wedge-shaped sections of trunk of all these

hickories, were on exhibition in the Forestry Department of the Centennial Exposition, Cincinnati. By the kindness of several carriage manufacturing firms, notably the Boyer Wheel Company, the Standard Wagon Company, both Cincinnati firms, and the Columbus Buggy Company, I was enabled to place on exhibit in the same department, specimens of spokes and other parts of carriages made of hickory wood. Some of these articles were shown in all the stages of manufacture, some in the finished state only. The toughness of hickory was beautifully shown by several broken spokes.

21. *White Oak* *Quercus alba*, *Linnaeus*. This is one of the most valuable species of the genus. It has a very wide range, extending from Maine west to Southeastern Minnesota, and south to the Saint John's River and Tampa Bay, Florida, and the valley of the Brazos River, Texas. It reaches its greatest development along the western slopes of the Allegheny Mountains, and in the valley of the Ohio River and its tributaries, where it often forms more than one-half of the forest growth. It attains the enormous height of 100 to 140 feet, and occasionally more, with a trunk four to six feet in diameter.

Wood strong, very heavy, hard, tough, close-grained, liable to check, unless carefully seasoned, durable in contact with the soil; layers of annual growth, strongly marked by several rows of large open ducts; medullary rays broad, prominent; color, brown, the sap-wood lighter brown; specific gravity, 0.7470; ash, 0.40; largely used in ship-building. Enormous quantities of white oak timber have been shipped from Northern and Eastern Ohio to England, to be used there for ship-building. It is also very extensively used in cooperage, in the manufacture of carriages and agricultural implements, in construction of all sorts, in basket-making, for railway ties, fencing, interior finish, cabinet-making, etc., and fuel.

The bark is used for tanning purposes; a decoction of the inner bark is used in medicine.

22. *Post Oak*. (Iron Oak, Turkey Oak.) *Quercus obtusiloba*, *Michaux*. Its native range extends from Massachusetts west through Southern Ontario and Michigan to Eastern Nebraska, Kansas and Indian Territory, south to Northern Florida and Texas. It is said to be the most common and widely-distributed oak of the Gulf States, west of the Mississippi river, forming the principal growth of the Texas "cross-timbers." "It is," says Dr. Warder, "a smaller tree as we see it in Ohio, and much less widely distributed. It prefers a light soil, and grows well even on poor lands. It grows slowly while young." The wood is valuable, preferred for some purposes even to the white oak. It attains a height of 60 to 80 feet, with a trunk of 3 to 4 feet in diameter. On the Florida coast it is reduced to a low shrub.

The wood of this tree is heavy, hard, close-grained, compact, checking badly in drying, very durable in contact with the soil; layers of annual growth marked by one to three rows of not large and open ducts; medullary rays numerous, conspicuous; color, dark or light brown, the sap-wood lighter; specific gravity, 0.8367; ash, 0.79; largely used for fence-posts—hence the name post-oak—railway-ties, fuel and somewhat for carriage stock, cooperage, construction, etc.

23. *Burr-Oak*. (Mossy-Cup Oak, Over-Cup Oak.) *Quercus macrocarpa*, Michaux. This tree extends further north than the other species and less towards the south. It is found in Nova Scotia, in New Brunswick, along the northern shores of Lake Huron to Lake Winnepeg. It extends further west than any oak of the Atlantic forests; for it is found at the eastern foot-hills of the Rocky Mountains of Montana, Central Nebraska, and Kansas. "The Burr Oak," says General Brisbin, "attains immense size in Indiana and some other northern States. A gentleman in Marion county, Indiana, told the writer: The Burr Oak, in this neighborhood, attains the diameter of six feet, and with a stem, in one instance, of sixty feet high, without a limb."

Of this tree, Dr. P. R. Hoy, of Racine, says: "This is perhaps the most ornamental of our oaks. Nothing can exceed the graceful beauty of these trees when not crowded or cramped in their growth, but left free to follow the laws of their development. Who has not admired these trees in our extensive burr-oak openings? Its larger leaves are dark green above, and bright silvery white beneath, which gives the tree a singularly fine appearance when agitated by the wind."

Wood heavy, strong, hard, tough, close-grained, compact, more durable in contact with the soil than that of any other American oaks; layers of annual growth marked by one to three rows of small open ducts; medullary rays often broad and conspicuous; color, dark or rich light brown, the sap-wood much lighter; specific gravity, 0.7453; ash, 0.71. The wood is even more valuable than that of the white oak (*Quercus alba*), and generally confounded with it. It is used for the same purposes for which that of the white oak is used. There are quite a number of varieties of this oak. Dr. P. R. Hoy says that the burr-oaks of Wisconsin do not generally attain more than one foot in diameter, and that the limbs grow near the ground, making a sort of espalier, and rarely grow higher than thirty to forty feet straight, with very rough bark.

24. *Swamp White Oak*. *Quercus bicolor*, Willdenow. This tree is found in all Northern States, reaching the highest development in the regions south of the great lakes. It does not extend further south than to Northern Georgia and Northern Kentucky. In Ohio, it is not uncommon, or is it abundant. "Rather scattering, found on low grounds near

water."—[Dr. Warder.] It reaches a height of seventy to eighty feet, with a trunk of four to seven feet in diameter.

Its wood is much like that of the White Oak, and used for the same purposes.

25. *Swamp Chestnut Oak.* (Basket Oak, Cow Oak.) *Quercus Michauxii, Nuttall.* A southern tree, growing on wet and swampy grounds; rare in this State, occurring along the Ohio River.—[Dr. Warder.] It attains a height of from seventy to eighty-five feet, with a trunk four to seven feet in diameter.

The wood is heavy, hard, very strong, tough, close-grained, compact, very durable in contact with the soil; easily split; layers of annual growth marked by a few, rather large open ducts; medullary rays broad, conspicuous; color, light-brown, the sap-wood darker; specific gravity, 0.8039; ash, 0.45; largely used in the manufacture of agricultural implements, wheel stocks, baskets, for which it is unsurpassed, for cooperage, fencing, construction and fuel.

It is not probable that it could be grown advantageously in Ohio.

In regard to the cultivation of oaks, let it be understood that the mode of raising them from acorns is the same in all the species. The acorns should be collected from the ground immediately after they have dropped, which in this latitude is in the latter part of September, and in October. They may be sown at once or be kept till the following spring. If they are to be kept, it is very important to see that they remain slightly moist and fresh till they germinate; for if they be allowed to get too dry, they will fail to sprout. The best method of keeping them in good condition is, to place them in moist sand, about three bushels of sand to every bushel of acorns. In this condition they may be stored away in the cellar or any other cool place, or buried in heaps covered with sods. Early in spring, when the ground is in proper condition, they should be planted in seed-beds about one inch deep, in rows about eighteen inches apart, and two inches apart in the row. The following spring they may be transplanted into nursery rows. When the seedlings are about four years old, they may be planted into permanent location, interspersed with other trees.

Very little has been done in this country in the way of raising oaks for economic purposes, and, therefore, much remains to be learned in the special branch of forestry. In due recognition of this, the late Dr. J. A. Warder commenced experiments in 1873-'74. His experimental plantation, at North Bend, Hamilton county, Ohio, which he laid out a

NOTE.—There are several other species of oaks, the wood of which is used in the manufacture of carriages, but as they do not occur in this region, no mention is made of them. Again, there are species, the wood of which may, and sometimes is, used in carriage-building, but as such use is not on account of any special value of the wood for such purpose, they, too, are omitted in this

superintended personally until his death in 1883, is certainly one of the most instructive spots for the American forester.

The whole plantation occupies about twenty-eight acres of hilly ground, about one-half of which is devoted to oak culture. It is laid out in rows four feet apart, and the trees four feet apart in the row. The plantation is arranged in the following manner :

1st row, consisting of Catalpa speciosa.

2d row, Catalpas, alternate with oaks.

3d row, Catalpas.

4th row, Catalpas, alternate with oaks, etc.

Dr. Warder's intention was to remove the Catalpas as soon as the oaks would be of sufficient size, when they would stand eight feet apart each way.

This mode of arrangement commends itself for several reasons, chief of which are :

1. The planting in rows facilitates cultivation.

2. The Catalpas, which are rapid growers, form a protection for the oaks.

So far the plantation presents a very good appearance. The oaks are in good shape and condition.*

26. *Yellow Birch.* (Gray Birch.) *Betula lutea, Michaux.* This is decidedly a northern tree, extending from Newfoundland and the northern shore of the Gulf of St. Lawrence and the western shore of Lake Superior and Rainy Lake, through the Northern States to Delaware and Southern Minnesota, and along the Allegheny Mountains to the high peaks of North Carolina and Tennessee. In the forests of the New England States and in Canada, it is one of the largest and most valuable deciduous trees, attaining a height of 70 to 90 feet and more, with a trunk of from 3 to 4 feet in diameter.

Wood heavy, very strong and hard, very close-grained, compact, satiny, susceptible of a very beautiful polish; medullary rays numerous, obscure; color, light brown, tinged with red, the heavier sap-wood nearly white; specific gravity, 0.6553; ash, 0.30; largely used for fuel, in the manufacture of furniture, bottom and tassel molds, pill and match-boxes, and for hubs of wheels.

By kindness of Mr. Burrows, of the Standard Wagon Company, Cincinnati, O., I was enabled to place on exhibit in the Forestry Department Centennial Exposition, four hubs of yellow birch—two being turned of wood grown in New York State, and two of wood from Indiana.

*Experiments of this kind in various parts of the State, not only with the oak, but with all the valuable forest-trees, are needed.

27. *White Pine.* *Pinus strobus, Linnaeus.* Of all the woods and trees of the American forests, this is certainly the one most extensively used for all purposes where lightness is desired. As its nature and distribution are generally known, nothing need be said concerning it.

This completes the list of woods used to any extent in the manufacture of carriages, at the present day.

With the growing scarcity of some of the trees enumerated in this paper, and with a better knowledge of American woods, it is, indeed, more than probable that other trees, which I have not enumerated here, will be resorted to by carriage-builders. In the meantime it is well enough to advocate the cultivation of these trees, which are certainly most admirably adapted to the purpose for which they are used.

As an incentive to farmers and landowners generally, it might be advisable for the Carriage Builders' National Association to offer premiums for the largest and best plantation of the most desirable trees, to be paid after a period of 5 or 10 years, from a specified time.

THE NAMES OF TREES USED IN THE MANUFACTURE OF CARRIAGES AND WAGONS, THEIR SIZE, TIME OF FLOWERING, TIME FOR GATHERING SEEDS, KINDS OF SEEDS, KIND OF SOIL THE TREE NATURALLY PREFERENCES.

Common names of trees.	Size, Ordinary height No. of feet.	Ordinary diameter No. of feet.	Time of flowering.	Time for gathering seeds.	Kind of seed.	Kind of soil the tree naturally prefers.
1 Yellow Poplar	80 to 100	3 to 4	MAY, JUNE.....	OCT., NOV.....	Nutlets imbricated in a cone.....	Dry open soils, not necessarily rich.
2 Linden.....	70 to 80	2 to 3	MAY, JUNE.....	SEPT., OCT.....	Nutlets attached to bracts.....	On low rich soil.
3 Honey Locust.....	80 to 100	2 to 4	JUNE.....	SEPT., OCT.....	Hard bean in long pod.....	On low rich bottom lands.
4 Dog-wood.....	20 to 30	2 to 1	MAY, JUNE.....	SEPT., OCT.....	Crimson berries.....	In rich woods.
5 Black Gum.....	30 to 80	1 to 3	APRIL, MAY.....	SEPT., OCT.....	Drupe containing stony nutlets.....	On flat, wet lands.
6 Persimmon	30 to 40	3 to 1 1/4	JUNE.....	SEPT., OCT.....	Large Berry.....	In rich bottom lands.
7 White Ash.....	70 to 100	3 to 6	APRIL, MAY.....	SEPT., OCT.....	Double-winged seed.....	Low, rich, moist soil.
8 Red Ash.....	60 to 70	1 to 2	MAY.....	" "	"	" "
9 Green Ash.....	30 to 40	1 to 2	MAY.....	" "	"	In low grounds near streams.
10 Blue Ash.....	60 to 90	1 to 2	MAY.....	" "	"	Limestone hills rarely found in bottoms.
11 Red Elm.....	50 to 70	1 to 2	MARCH, APRIL.....	MAY, JUNE.....	Winged disk.....	Rich lands and hillsides.
12 White Elm.....	90 to 110	5 to 8	APRIL.....	MAY, JUNE.....	"	On rich, moist soil.
13 Rock Elm	70 to 100	2 to 3	MAY, JUNE.....	" "	"	On low, wet, clay, rich uplands, rocky declivities.
14 Wahoo, Winged Elm.....	30 to 40	1 to 2	APRIL.....	" "	"	Dry gravelly soil.
15 Osage Orange.....	50 to 60	1 to 2	MAY.....	OCTOBER.....	Nutlets in large fruit resembling an orange.....	On rich soil.
16 Shell-bark Hickory.....	80 to 100	3 to 4	APRIL, MAY.....	SEPT., OCT.....	Nut in valved shuck.....	On rich, flat lands.
17 Big Shell-bark Hickory.....	80 to 100	2 to 4	APRIL, MAY.....	SEPT., OCT.....	"	On rich lands near streams.
18 Mockernut Hickory.....	60 to 90	3 to 4	APRIL, MAY.....	SEPT., OCT.....	"	On rich upland hillsides.
19 Pig-nut Hickory.....	60 to 80	3 to 4	MAY.....	SEPT., OCT.....	"	On dry hills and uplands.
20 Bitter-nut Hickory	50 to 80	2 to 3	APRIL, MAY.....	SEPT., OCT.....	"	Border of streams and swamps, low ground.
21 White Oak	100 to 120	4 to 6	MAY.....	" "	"	Light soils or clay.
22 Post Oak	60 to 80	3 to 4	MAY.....	" "	"	Light soils, grows well on poor lands.
23 Burr Oak.....	60 to 70	4 to 6	MAY.....	" "	"	Strong soils resting on clay.
24 swamp White Oak.....	70 to 80	4 to 6	MAY.....	" "	"	On low grounds near water.
25 Swamp Chestnut Oak.....	70 to 85	4 to 7	MAY.....	SEPT., OCT.....	Minute, winged in catkins.....	On wet and swampy grounds.
26 Yellow Birch.....	70 to 90	3 to 4	APRIL, MAY.....	SEPT., OCT.....	"	Rich woodlands.
27 White Pine	70 to 100	4 to 7	MAY.....	SEPT., OCT.....	Nutlets in long cone.....	Sandy loam upon drift formation.





1	Yellow Poplar	23
2	Linden.....	25
3	Honey Locust.....	20
4	Dogwood.....	67
5	Black Gum.....	52
6	Perlmutter	96
7	White Ash	42
8	Red Ash	26
9	Green Ash.....	65
10	Blue Ash.....	78
11	Red Elm	83
12	White Elm	80
13	Rock Elm.....	80
14	Wahoo or Winged Elm	59
15	Osage Orange	73
16	Shell-bark Hickory	56
17	Big Shell-bark Hickory	56
18	Mocker-nut Hickory	56
19	Pig-nut Hickory	56
20	Bitter-nut.....	56
21	White Oak	56
22	Post Oak	56
23	Burr Oak	56
24	Swamp White Oak	56
25	Swamp Chestnut Oak	56
26	Yellow Birch	56
27	White Pine	56

LUMBERMEN AND FORESTERS.

BY ADOLPH LEUE, SECRETARY.

The unpleasant relation existing between lumbermen and some friends of forestry, which, in some instances, has degenerated into open hostilities, is ill calculated to promote the forestry interest in this country. This unhappy state of affairs appears more strange when we call to mind that the interest of both parties is a mutual one; for whatever else may induce man to engage in practical forestry, his chief object will ever be the raising of forests for profit, and this profit is realized through the lumberman. The lumbering interest, on the other hand, is dependent upon a generous supply of forests.

The time has gone by in which our forests were thought to be inexhaustible; from year to year our forest area has been diminished. That, under these circumstances, the time must come, when the supply will fall short of the demand, is evident. Lumbermen of to-day are looking with serious apprehension to the time when a TIMBER FAMINE will be upon us. Thus said a prominent Chicago lumberman, after reading a letter which contained a liberal offer for a scraggy lot of pine in a section of Wisconsin, difficult of access.* "In twenty-five years from this time a pine tree will be as much of a curiosity in the Northwest as an elephant is now, and the people who will occupy the benches in Barnum's circus in the summer of 1922, will as gladly give their twenty-five cents to look upon a thoroughbred, well-developed, healthy-looking log, from the virgin forests of Wisconsin or Michigan, and listen to the clown's ridicule of the extravagance of the past (present) century, as are the prominent lumbermen of to-day, who, at every opportunity, under the guise of giving their children a chance to see the animals, go to 'the show' to satisfy their curiosity as to the elephant's mission on earth." "And," THE TIMBERMAN adds, "he was as sober as a judge when he said it. Though apparently conscious that he had done as much toward denuding the forests as anybody, it was not thought to him that a time should come, in the Northwest, when the axe must be exchanged for the plow-share, and the hand-saws be replaced with harvesters and reapers."

¹ THE TIMBERMAN, December 17, 1887, p. 5.

Another gentleman, speaking of the yellow pine regions of the South, said: "We need help in the development of the South, yet I could wish, and it would be justice itself, if those of us who have borne the burden of these times of depression in the South, could hold on to enough of our natural wealth to make us independent of this incoming tide of investors. And, again, further investigation will show that the general estimates as to the quantity of yellow pine and other timber in the South have been exaggerated, and a canvass of the timber tracts will show a lesser average number of feet to the acre than has been universally reported. I believe those people, who have gotten into their heads the idea that the supply will be unlimited for the coming generations, will arrive at a wiser conclusion in proportion as the days and years of their lives come on apace."

Now, as regards the timber region of the Pacific coast, the editor of the Humboldt, Cal., STANDARD, says: "How the mighty have fallen! The 200-feet-to-first-limb-straight-as-a-ship's-mast-to-a-height-of-300-feet-seven-foot-in-diameter-trees are not so plenty as they once were; the once common 40-foot-in-diameter-redwood-trees no longer thickly stud our forests as grape-vines crown our hill-sides. Alas! our matchless redwood forests are now melting away before the woodman's axe and the ravenous tooth of the saw, like snow under the tropical sun. A score of years hence scarcely a vestige will be left, and our people will know and appreciate its great value."

These three pictures of the great American lumber regions of the present day may suffice to indicate the gradual decay of our forests.

To even approximately estimate the number of years the woodlands of the present day will be able to stand the enormous drain upon timber, and other forest-products, is, with our present knowledge of the extent and conditions of the woodlands in this country, simply impossible, as is instanced by Prof. Sargent's conclusion regarding the pineries of the Northwest. Whatever the real extent of the forest area of the United States may be, it is certain that *it is at a constant and rapid decrease, and that the time is approaching when the present supply shall be exhausted.*

Assuming Mr. Plat B. Walker's estimate, as given by a correspondent in the LUMBER TRADE JOURNAL of October 15, 1886, that the pine-lands of Minnesota and Michigan "will last at least thirty years longer," to be correct, or nearly so, and considering that only a few kinds of our forests, which we may plant to-day, will reach maturity in that short period and that some will take two, three, or even four times that number of years to mature, we needs must come to the conclusion that *the time fully come at which the planting of forest-trees on a large scale should be commenced.*

In European countries, where, by a well-developed system of forest

the several governments maintain a certain amount of their superficial area in forests, ample provision is made for a liberal supply of forest-products. But in this country, where no such system of forestry exists, and where the demand upon forest-products is even greater than that in any country of Europe, there is every prospect for an ultimate timber famine, unless rigid economy be practiced in the use of the present supply, and steps be taken towards raising artificial forests.

The first, and perhaps the most important question is: *Where shall these forests be located?*

The general cheapness of the land, and its adaptedness for the production of timber, the existing facilities for transportation, the location of saw-mills and drying-houses, the wood-working industries in or near the present lumber regions, are considerations which point to those parts of the country which for several decades have supplied the world with timber. Again, it must be admitted that lumbering in its every department is a profession, in the interest of which towns and villages have been built. When, now, the last patch of woodland shall have been cut, the inhabitants of these places, finding themselves without employment will emigrate, and their former houses will be desolate. If, by a wise foresight, the owners of denuded woodlands resolve to reforest those regions and immediately carry out such resolutions, that calamity might possibly be averted.

That the increasing demand upon, and the growing scarcity of timber will necessarily result in an advance in the price of lumber, is self-evident. It has repeatedly been demonstrated that, even at the present price of timber, forestry will pay. This being the case, it certainly will pay the lumberman to reforest the lands which have been denuded of trees and are lying waste.

The planting of forests by farmers will, I am confident, never amount to much, because they, as a rule, cannot, and will not, spare much land for forestry purposes, and, in addition to this, they cannot wait forty or more years for the return of their investment, however small it be. Their planting will most likely be confined to the raising of wind-breaks and shelter-belts, and of ornamental trees, which can hardly be called forestry.

Under these circumstances it would certainly be greatly in the interest of lumbering, if lumbermen and owners of large tracts of land not suitable for agricultural purposes, but good enough for forest trees, would organize a forestry department of their own. Each lumberman should have his forester, not only for the purpose of raising artificial forests, but so for husbanding those now standing.

Such an action by lumbermen generally, would be the first step towards practically solving the forestry problem of this country.

REPORT ON THE FORESTAL EXHIBIT

IN THE CENTENNIAL EXPOSITION OF THE OHIO VALLEY AND CENTRAL STATES, HELD IN CINCINNATI, OHIO,

From July 4, 1888, to November 10, 1888.

BY ADOLPH LEUE, ASSOCIATE COMMISSIONER ON FORESTRY.

- I. Objects Illustrating the History of the Forestry Movement in America.
- II. Natural History as Applied in Forestry.
- III. Forest-Culture.
- IV. Forest Technology.
- V. Schools of Forestry.
- VI. Miscellaneous Articles of Interest to Forestry.

FORESTRY AT THE CENTENNIAL EXPOSITION

OF THE OHIO VALLEY AND CENTRAL STATES, HELD IN CINCINNATI, OHIO, FROM JULY 4 TO OCTOBER 27, 1888.

BY ADOLPH LEUE, SECRETARY.

Never before, in the history of this country, was forestry brought more prominently to the attention of the American people, than during the Centennial year, in the Exposition held in Cincinnati. For, besides numerous forestry objects incidentally shown in various departments of the Exposition, as, for example, in connection with wood-working machinery, there were four distinct forestal exhibits, namely:

1. The Forestry Department in the Ohio Exhibit.
2. The Forestry Division in the United States Government Exhibit.
3. The Forest Products in the Florida Exhibit.
4. The Forest Products in the West Virginia Exhibit.

These several exhibits afforded a rare opportunity for study, of w

students of forestry availed themselves. The beneficial influence, which these exhibits exerted upon the advancement of forestry, is by no means confined to the direct information they imparted at the time being, but will be felt for years to come in all parts of the country, inasmuch as they have created and stimulated a desire for further research, as is beautifully instanced by the efforts made by several prominent educators in Cincinnati and elsewhere, to make collections of forest products of their respective vicinities for study in the schools. To assist in such laudable undertakings, and to induce others to follow the example, an enumeration and description of the objects shown in the Ohio exhibits will be of interest.

THE FORESTRY DEPARTMENT IN THE OHIO EXHIBIT, UNDER THE SPECIAL SUPERVISION OF ASSOCIATE COMMISSIONER, ADOLPH LEUE.

This was, unquestionably, the most varied and most extensive forestry collection in the Exposition. It consisted of *six* distinct departments, namely :

1. History of Forestry in America.
2. Natural History, as Applied to Forestry.
3. Forest Culture.
4. Forest Usufruct.
5. Forest Technology.
6. Schools of Forestry.

Unfortunately, the facilities for a proper display of the various objects in this department were altogether inadequate to the amount of material. Many interesting objects did not appear to advantage, and some were excluded entirely for want of space.

I. Objects illustrative of the history of forestry in America.

This division embraced—

A. PORTRAITS OF PROMINENT AMERICAN FORESTERS, WITH BIOGRAPHICAL NOTES. These, some of which are very extensive, were not displayed, but were kept in a portfolio, open to friends of forestry. The following were represented :

1. Dr. John A. Warder, North Bend, O., died July 14, 1883.
2. Arthur Bryant, Princeton, Ill., died in March, 1883.
3. Leo B. Hodges, St. Paul, Minn., died April 14, 1883.
4. Adolph Strauch, Cincinnati, O., died April 25, 1883.
5. Suel Foster, Muscatine, Ia., died in 1885.
6. Dr. Franklin B. Hough, Lowville, N. Y., died June 11, 1885.
7. James Little, Montreal, Can., died October 2, 1883.
8. Dr. Geo. Engelmann, St. Louis, Mo., died February 4, 1884.
- Prof. Asa Gray, Cambridge, Mass., died January 30, 1888.

10. Dr. John Torrey, New York, N. Y., died 1873.
11. Prof. N. H. Egleston, Washington, D. C.
12. Cassius M. Clay, White Hall, Ky.
13. Green Clay, father of Cassius M. Clay.
14. Dr. Carl Mohr, Mobile, Ala.
15. Dr. Geo. Vasey, Washington, D. C.
16. Ex-Gov. Robert W. Furnas, Brownville, Neb.
17. John Sterling Morton, Nebraska City, Neb.
18. B. E. Farnow, Washington, D. C.
19. Prof. C. V. Riley, Washington, D. C.
20. Gen. James Brisbin, U. S. Army.
21. Dr. John B. Peaslee, Cincinnati, O.
22. Waldo F. Brown, Oxford, O.

B. HISTORICAL CHART SHOWING THE GRADUAL DEVELOPMENT OF THE ORGANIZED EFFORTS IN BEHALF OF FORESTRY. It was prepared under the direction of Hon. B. E. FERNOW, of Washington, D. C., and is of special interest to students of the History of Forestry.

The following is a correct copy:

The Exhibit of the American Forestry Congress.

Chart showing the Forestry interest in the United States in 1888, by B. E. Farnow, of Washington, D. C.:

Acres covered with wood, 450,000,000, or 26% total land area.	
Acres burnt over in the census year 1888, 10,274,089; loss, \$25,462,250.	
Acres cut over annually, 25,000,000.	
Wood consumed annually:	
Timber and lumber, cubic feet.....	3,800,000,000
Railroads	500,000,000
Fences	500,000,000
Fuel.....	18,000,000,000
Export	200,000,000
Total cubic feet.....	23,000,000,000
Wood growing annually on the forest area of the United States, cubic feet..	
Saw-mill capacity in the U. S., b. m. ft.....	60,000,000,000
Acres of timber-land belonging to the U. S. government.....	70,000,000
Value of timber stolen from public lands during seven years	\$36,719,
Amount recovered	478,
Amount expended in protective service.....	455

Forest administration of U. S. Government (None).

Forestry Division of Department of Agriculture, appropriation.....	\$10,
Prussian Forestry Bureau of Information, appropriation.....	47

State Forestry Administrations.

NEW YORK—State Forestry Commission established in 1885. State forests. 715,000 acres.

OHIO—State Forestry Bureau established in 1885. No State forest lands.

COLORADO—Forestry Commission established in 1885. No State forest lands.

CALIFORNIA—Forestry Commission established in 1886. Experiment Stations.

KANSAS—Forestry Stations established in 1887.

Forestry Associations.

American Forestry Congress (originated in Cincinnati, Ohio).....	1882
Minnesota State Forestry Association, organized.....	1876
Ohio State Forestry Association, ".....	1883
Colorado State Forestry Association, ".....	1884
Southern States Forestry Congress, ".....	1885
New York Forestry Association, ".....	1886
Pennsylvania Forestry Association, ".....	1886
Illinois Forestry Association, ".....	1887
Texas Forestry Association, ".....	1887
Kentucky Forestry Association, ".....	1888

Arbor Day.

Established in the following States :

Nebraska in.....	1872	Michigan in.....	1876
Iowa in.....	1874	Ohio in.....	1882
Kansas in.....	1875	West Virginia in	1883
Minnesota in	1876	Dakota in.....	1884
Indiana in	1884	Rhode Island in.....	1887
New Jersey	1884	New York in.....	1887
Pennsylvania in.....	1885	Maine in	1887
Vermont in	1885	Illinois in.....	1887
Colorado in	1886	Nevada in	1887
Massachusetts in.....	1886	Montana in	1887
Connecticut in	1886	California in	1887
Idaho in.....	1886	New Hampshire in	1887
Missouri in.....	1886	Alabama in.....	1887
Kentucky in	1886	Tennessee in.....	1887
Florida in	1886		

Results of Devastation and Destruction of Forests.

Formation of Torrents and Waste-lands.

Avelanches and Land-slides.

Destructive Floods.

Unequal Distribution of Rainfall.

Extremes of Climate.

Unhealthfulness.

Impoverishment of Soil.

Unfavorable Agricultural Conditions.

Deficiency of Valuable Material.

C. A PORTFOLIO CONTAINING A LARGE COLLECTION OF CIRCULARS AND ANNOUNCEMENTS RELATING TO FORESTRY ASSOCIATIONS.

1. A complete set of all announcements of the American Forestry Congress.
2. A complete set of the circulars issued by the Ohio State Forestry Association and the Ohio State Forestry Bureau.
3. A copy of every circular issued by the Colorado Forestry Association and by the Forestry Commissioner of that State.
3. All the publications of the Pennsylvania Forestry Association.*
4. Copies of Arbor Day proclamations by the Governors of different States, which are copied in another part of this report.
5. A collection of works on Forestry published in this country, embracing also the Government and State Reports upon Forestry.
6. Copies of Forestry-Laws in the United States, published as an appendix to this report.

D. EMBLEMS OF FORESTRY ASSOCIATIONS IN THE UNITED STATES, badges and other insignia worn on memorable Forestry Conventions, notably badges used at the FIRST meeting of the American Forestry Congress, April 24, 25, 26, 27, 1882, at Cincinnati, O.

* By courtesy of Mr. Hartzell, a great number of Forest Leaves, the official organ of the Pennsylvania Forestry Association, were distributed in the Ohio Forestry Department.

ARBOR DAY PROCLAMATIONS.

In the Historical Division of the Forestry Department of the Ohio Exhibit, a number of certified copies of some noted Arbor Day Proclamation were shown. One of the most interesting of these was the copy of the First Arbor Day Proclamation ever issued, obtained by courtesy of his Excellency, J. M. Thayer, Governor of Nebraska.

The copy was nicely executed, and the Great Seal of the State of Nebraska affixed. It is as follows :

ARBOR DAY—PROCLAMATION.

By the Governor of the State of Nebraska :

WHEREAS, The Nebraska State Board of Agriculture, at its January meeting, 1874, adopted the following resolutions :

Resolved, That the second day of April of each year, be, and the same is hereby designated, dedicated, and set apart as

“ARBOR DAY,”

for the State of Nebraska, and that the agriculturists of Nebraska be requested to petition the legislature to make said *Arbor Day a legal holiday*.

That until so made a holiday, the Governor be requested to call attention to said *Arbor Day*, by Proclamation, and request the whole people of the State to observe it, by planting Forest, Fruit or Ornamental trees.

AND WHEREAS, I have been officially notified by the President of said Board, and by him requested to comply therewith.

Now, THEREFORE, I, Robert W. Furnas, Governor of the State of Nebraska, do hereby publicly proclaim the aforesaid transactions of the State Board of Agriculture, and both respectfully and urgently recommend that the day designated, viz.: the 8th day of April, 1874, be observed by the people of this State, as desired and expressed in the resolution herein referred to.

In testimony whereof, I have hereunto set my hand and caused the [Great seal of the State of Nebraska] Great Seal of the State of Nebraska to be affixed, on the 31st day of March, A. D. 1874.

ROB'T W. FURNAS.

By the Governor :

JOHN J. GOSPER, *Secretary of State.*

STATE OF NEBRASKA,

EXECUTIVE DEPARTMENT.

I hereby certify that the accompanying document is a correct copy of the First Arbor Proclamation, issued by the Governor of this State.

In testimony whereof, I have hereunto set my hand and caused to be affixed the Great Seal of the State of Nebraska, on this 3d day of May, A. D. 1888.

JOHN M. THAYER,
Governor.

A PROCLAMATION.

IN THE NAME AND BY THE AUTHORITY OF THE COMMONWEALTH OF PENNSYLVANIA.

In pursuance of a goodly precedent, and in compliance with a request of the General Assembly of the Commonwealth of Pennsylvania, contained in a concurrent resolution, approved the 30th day of March, A. D. 1887, I have appointed and designated, and do hereby appoint and designate, Friday, the 22d day of April, A. D., as

ARBOR DAY.

And I do earnestly recommend to the people of the Commonwealth, that they devote the whole, or at least a portion of the said day to the planting of trees and shrubbery wherever it may be proper and convenient so to do.

Let school directors, teachers and scholars unite in making it a day for the adornment of the grounds surrounding the school-houses throughout the Commonwealth. Let the people of our towns and villages make it a day for the planting of trees along their streets. Let the people in our rural regions see to it that their highways are beautified by the planting of trees upon their borders. Let families observe the day in the planting of trees and shrubbery in the grounds surrounding their homes. Let the farmers see to it that the waste places on their farms are turned to profitable account by the planting of timber, nut and fruit trees thereon. Let all the people understand that upon the general observance of this day, and the practical results which arise therefrom, in large measure depend the continuance of regular seasons of rainfall, the tempering of our climate, the beauty of our homes and highways, the timber supply of the future, and the remunerative return for labor bestowed upon lands not otherwise productive.

The observance of Arbor Day is becoming general in many of our States; its necessity is recognized by those who have given the greatest care and study to the subject; and its practical usefulness is attested by all who have engaged in it.

In case the day herein designated should be unsuitable in any portion of the Commonwealth, let an adjournment be had to some future day, which will suit the climate and convenience of the locality.

Given under my hand and the Great Seal of the Commonwealth, at Harrisburg, this 1st day of April, in the year of our Lord, one thousand eight hundred and eighty-seven, and of the Commonwealth, the one hundred and eleventh.

[SEAL.]

By the Governor:

CHAS. W. STONE,

Secretary of the Commonwealth.

JAMES A. BEAVER.

REMARK.—In reference to the above Arbor Day Proclamation, the editor of Forest Leaves, says: "It is strange to think that but two hundred years from the settlement of this once well-forested region, there should be a general call on our people to plant trees, as matter, not of taste, but of necessity, to prevent the disastrous alternations of drought and flood from turning fertile Pennsylvania into an arid country, depend-

ent on irrigation for its scanty crops—a future to which we are rapidly tending. What we have to do now, however, is to act, not to lament. Let the due observance of Arbor Day once fill the minds of our people with a love of trees, and as appreciation of their use, let them plant trees and care for them, and the future of Pennsylvania will be assured."

ARBOR DAY PROCLAMATION.

IN THE NAME AND BY AUTHORITY OF THE COMMONWEALTH OF PENNSYLVANIA.

Whereas, By a concurrent resolution of the General Assembly of the Commonwealth of Pennsylvania, approved the 30th day of March, A. D. 1887, the Governor of the Commonwealth was requested to appoint annually a day to be designated as Arbor Day in Pennsylvania, and to recommend by Proclamation to the people on the days named, the planting of trees and shrubbery in the public school grounds and along the public highways throughout the State; and

Whereas, The observance of Arbor Day heretofore has been found to be productive of much practical good; therefore,

I, James A. Beaver, Governor of the said Commonwealth, have appointed and designated, and do hereby appoint and designate, Friday, the 27th day of April, A. D. 1888, to be observed as ARBOR DAY throughout the said Commonwealth. Not only should trees and shrubbery be planted in the public school grounds and along the public highways throughout the State, but increased attention should be given to the planting of trees wherever they can be properly cultivated. Thousands of acres of farm lands, otherwise unproductive, can be turned to profitable account, by the cultivation of timber, nut and fruit-bearing trees. The subject should receive the careful and considerate attention of all who are interested in the prosperity of the Commonwealth, and in a remunerative return for money invested in and the labor expended, upon their lands. The observance of the day should not be confined to literary exercises in, and tree-planting by, our public schools. It is a subject which demands, and should receive, the thoughtful attention and careful consideration of all our people. The general observance of the day should result in the planting of large numbers of trees, not only for shade and ornament, but for practical uses and profitable return in the future. The incidental advantages which will result to the community are great and varied. The necessity for increased attention to the general subject of forestry is becoming more and more apparent. There should be not only an increased attention to the dissemination of knowledge upon the subject, but a great increase in the number of trees annually planted. If the grounds surrounding our school-houses are filled with trees and shrubs, let the scholars secure permission from the owners of lands along the highways to plant trees in such a way as to be protected from injury, and at the same

afford beauty and shade to the passer-by.

Parents and children and citizens generally, are recommended to join in the observance of this day, and to seek opportunities and avenues for extending its influence and efficient results. If the day should not be sufficient for the accomplishing of all that is desired, let the work be continued on the following day; and if for any reason it should be made impracticable to observe the day fixed as Arbor Day, let the community choose some other day which will be more suitable for the locality.

Given under my hand and the Great Seal of the Commonwealth, at Harrisburg, the

twenty-first day of March, in the year of our Lord one thousand eight hundred and eighty-eight, and of the Commonwealth, the one hundred and twelfth.

[SEAL.]

By the Governor:

CHAS. W. STONE,

Secretary of the Commonwealth.

JAMES A. BEAVER.

ARBOR DAY PROCLAMATION.

To the People of Nebraska:

Spring-time is at hand—the time to plant trees. Therefore, in accordance with an appropriate custom, now well established and recognized by law, I hereby designate the 23d day of April, 1888, as

ARBOR DAY,

And I do earnestly request the people throughout this State to plant trees, *plant trees, PLANT TREES*; and the present and future generations will rise up and call you blessed.

If, unfortunately, the weather should be so stormy as to prevent the work on that day, please do not fail to observe the next fair day.

In witness whereof, I have hereunto set my hand, and caused to be affixed, the Great Seal of the State of Nebraska.

[SEAL.] Done at Lincoln, this 21st day of March, A. D. 1888.

JOHN M. THAYER.

By the Governor:

G. L. LAWS,

Secretary of State.

ARBOR DAY PROCLAMATION.

TERRITORY OF DAKOTA, EXECUTIVE DEPARTMENT,

BISMARCK, March 20, 1888.

In conformity with custom and the sentiment of our people, I, Louis K. Church, Governor of Dakota, do hereby designate Wednesday, April 25, as Arbor Day for that portion of Dakota lying south of the seventh standard parallel of latitude, and Thursday, May 5, as Arbor Day for that portion of Dakota lying north of such parallel, and I do declare the same a legal holiday, and request that the people devote the day as designated to the planting of trees, shrubs and vines in and about public and private grounds and ways; and I especially urge appropriate observance in our public schools, and that public officials and citizens generally aid in making the day one that will confer a blessing to the future as well as a benefit to the present; and I would call attention to the wise laws of Dakota to this important subject, which is as follows:

"On all public highways of not less than sixty-six feet in width, the owners, occupants or claimants of adjoining lands may use and occupy one rod in width of said highway adjoining such lands for the purpose of cultivating the growth of timber and trees thereon;

provided, that the same be kept continuously in good order and under full timber and tree cultivation.

"Any person cultivating a hedge upon his land adjoining a public highway, and desiring to fence the same, may place such fence seven feet over and upon such highway; provided, that it do not obstruct the public travel.

"Every person planting one acre or more of prairie land within five years after the passage of this act (March 13, 1885), with any kind of forest-trees except black locust and cottonwood, and successfully growing and cultivating for three years, shall be entitled to receive for ten years thereafter, an annual bounty of two dollars for each acre so planted and cultivated, to be paid out of the territorial treasury; but such bounty shall not be paid any longer than such grove of trees is maintained and kept in growing condition.

"Any person wishing to secure the benefit of this act shall, within three years after planting such grove of trees, and annually thereafter, file with the county auditor or clerk of the county in which the same is located, a correct plat of land, describing the section or fraction thereof on which such grove has been planted or cultivated, and shall make due proof of such planting and cultivation as well as of the title to the land, by oath of the owner and the affidavit of two householders residing in the vicinity, setting forth the facts in relation to the growth and cultivation of the grove of trees for which such bounty is demanded. The several county auditors or clerks shall, on or before the first Monday of August of each year, forward to the territorial auditor a certified list of all the lands and tree-planting reported and verified to them in compliance with this act, with the name and post-office address of the respective owners thereof; provided, this act shall not apply to any railroad company for planting of trees within two hundred feet of its track for the purpose of making a snow-fence, nor to any trees planted upon land held, entered and acquired under the timber culture law of the United States.

"If the territorial auditor shall find that the provisions of this act have been duly complied with, he shall issue to the several applicants entitled thereto his warrant upon the territorial treasurer for the bounty so earned."

IN WITNESS WHEREOF, I have hereunto subscribed my name and caused the Great Seal [SEAL.] of Dakota to be affixed this 20th day of March, 1888.

LOUIS K. CHURCH, *Governor.*

By the Governor:

M. L. McCORMACK,

Secretary.

ARBOR DAY PROCLAMATION.

STATE OF ILLINOIS, EXECUTIVE DEPARTMENT,
SPRINGFIELD, *March 13, 1888.*

AN ACT

To encourage the planting of trees.

SECTION 1. *Be it enacted by the people of the State of Illinois, represented in the General Assembly,* That the Governor shall annually, in the spring, designate by official proclamation, a day to be designated as Arbor Day, to be observed throughout the State as a day for planting trees, shrubs and vines about the homes and along highways and about public lands within this State, thus contributing to the wealth, comfort and attractions of our

To give effect to, and to carry into execution the foregoing act, Friday, the 30th day of April, 1888, is hereby designated as Arbor Day.

I earnestly commend to the people of the State, the observance of said day. It is believed great good will result from an earnest effort by the public to inaugurate and perpetuate a day for the special purpose of planting trees, shrubs and vines. It would greatly add to the beauty of our State, could every home, school-house, church, highway and public grounds, be ornamented by trees, arbors, shrubs and vines, and great benefit would result from planting forest-trees, which in time would immensely increase the value of our lands. Should local committees agree to co-operate in this respect, a great deal would be accomplished; but whether committees shall co-operate, or individuals alone, undertake to adorn and beautify the State, there can be no doubt that if the day is properly inaugurated and habitually observed, great public and private good will result from its observance.

IN WITNESS WHEREOF, I hereto set my hand, and cause the Great Seal of the State to [SEAL.] be affixed.

Done at Springfield, the day and year first above written,

RICHARD J. OGLESBY.

By the Governor:

HENRY D. DEMENT,
Secretary of State.

ARBOR DAY PROCLAMATION.

STATE OF KANSAS, EXECUTIVE DEPARTMENT,
TOPEKA, February 9, 1888.

The designation, by the Executive, of a day to be devoted to the planting of trees, has been approved by public sentiment, and is justified by the experience and results of former years.

Therefore, I, John A. Martin, Governor of Kansas, do hereby designate and appoint, Wednesday, April 4, as Arbor Day, and do request the people of Kansas to devote that day to the planting of trees, forest, fruit, shade or ornamental, around their homes, in their fields, along the highways, and in the grounds surrounding schools, churches, and other public buildings.

The officers of the several school districts of Kansas, and the teachers employed in the public schools, are especially urged to give attention to the planting of trees in school grounds and parks.

IN TESTIMONY WHEREOF, I have hereunto subscribed my name, and caused to be affixed, the Great Seal of the State. Done at Topeka, this 9th day of February, A. D., 1888, and of the State, the twenty-eighth.

JOHN A. MARTIN.

By the Governor:

E. B. ALLEN,
Secretary of State.

1887.

ARBOR DAY PROCLAMATION.

STATE OF OHIO,
EXECUTIVE DEPARTMENT.

As provided for by law, and in recognition of the propriety thereof, and because of the good results to be derived therefrom, I, Joseph B. Foraker, Governor of Ohio, do hereby designate and appoint Thursday, the 21st day of April, A. D. 1887, to be observed as Arbor Day.

Experience is constantly teaching us the importance of preserving and improving our forests, not only to answer the demand of beauty and ornamentation, but also and more particularly because of the effect upon our climate, rainfall, soil, and for many other important and beneficial purposes which they subserve.

I, therefore, recommend that trees and shrubbery be planted in all the towns and cities, and on the farms and along the streets and highways of the State, and that the day be observed not only by such plantings, but also by the study and discussions of the general subject of forestry and tree culture.

In testimony whereof, I have hereunto subscribed my name, etc.

J. B. FORAKER.

By the Governor:

J. S. ROBINSON,
Secretary of State.

LAWS RELATING TO ARBOR DAY.

OHIO.

The following joint resolution (H. J. R. 40), governs the issuing of Arbor Day Proclamations by the Governor of this State:

“WHEREAS, The forests of the State are rapidly disappearing to an alarming extent, therefore, be it

Resolved by the General Assembly of the State of Ohio, That the Governor be and is hereby authorized to issue a proclamation, annually, setting apart a day in April for the planting of forest trees, and recommending that the day be devoted by the people to that purpose.”

Passed the House on March 27th, A. D. 1882; was concurred in by the Senate April 7th, A. D. 1882.

BOARDS OF EDUCATION TO CAUSE TREES TO BE PLANTED IN SCHOOL GROUNDS.

Section 3987a. That the boards of education of cities and villages, and directors of sub-school districts shall, in the months of March, April, May or November, in the year and in said months of each year thereafter, in the school-yards and grounds under respective control, plant or cause to be planted, where the same is not already provided, such number of shade and ornamental trees as will, in their judgment, furnish shade and shelter for the scholars attending said schools, and beautify said grounds.

2. That the costs and expenses incurred by said boards of education or directors of sub-school districts, as the case may be, shall be paid out of the contingent school fund of said village or sub-district, on the certificate of said boards.

3. This act shall take effect and be in force from and after its passage.

April 4, 1884.

ARBOR DAY PROCLAMATION.

STATE OF COLORADO, GOVERNOR'S OFFICE,
DENVER, COLORADO, *April 2, 1888.*

The balmy mildness of the morning breeze, which comes to us burdened with the breath of spring, reminds us that the time for planting trees has come again. And in obedience to the law, and in accord with the sentiments of our people, I hereby designate the birthday anniversary of General U. S. Grant—Friday, the 27th day of April—as Arbor Day.

Nature has placed us amid kindly surroundings. Nowhere is Nature more indulgent. Nowhere does the soil respond with a more lavish generosity, or does the sun shine with more genial warmth. Nowhere does the Great Artist paint the bloom of health with such an indelible pencil as under the fair skies of Colorado.

Let us utilize all the resources of art and industry to embellish and beautify these rich gifts of Nature, by the planting of orchards, forests and gardens. Let us, with tree and vine, shrub and flower, make beautiful and attractive this land in which we live. Pleasure, profit, gratitude and affection should all impel us to plant trees and to care for them.

The children in our schools, the dwellers upon the farm or in the town, should all give hand to this good work, which will bring rich reward to those who live to-day, and an inheritance of beauty, fragrance, fruit and flowers to those who come after us.

ALVA ADAMS, *Governor.*

Attest: JAMES RICE,
Secretary of State.

FOREST-BOTANY.

This branch of forestry was represented—

1. By botanical specimens.
2. By collections of seeds of forest-trees.
3. By several collections of sections of forest-trees.
4. By wood-cuts of forest-trees.
5. By lithographic representation of autumn leaves.
6. By photographic views of groups of forest-trees.
7. Root Herbarium.

1. BOTANICAL SPECIMENS.

(a) Collection of twenty-five species of American oaks, and twenty-five species of cone-bearing trees prepared and exhibited by Professor Jos. F. James, formerly botanist of the Cincinnati College of Pharmacy.

This beautiful collection, which was arranged separately directly east of the raised map of Ohio, was not catalogued during the progress of the Exposition, and as a request for a catalogue was not complied with by the proprietor of the collection, an enumeration of the species here is impossible.

(b) Collection of Cryptoganeous plants owned and exhibited by Mrs. Adolph Leue, of Cincinnati, was, for want of sufficient space, placed in the Educational Department. The collection contained about three hundred choice specimens of Clubmosses, Ferns, Mosses, Liverworts, Lichines and Fungi, and was universally admired.

Mrs. Leue was awarded the Certificate of Merit.

2. FOREST-TREE SEEDS.

A. Collection in glass jars, all labeled—owned by A. L.:

1. *Magnolia acuminata*, L. Cucumber tree.
2. *Liriodendron tulipifera*, L. Tulip tree.
3. *Asimina triloba*, Dunal. Paw Paw.
4. *Tilia Americana*, L. American Linden.
5. " *Europaea*, L. European Linden.
6. *Xanthoxylum Americanum*, Miller. North Prickly Ash.
7. *Ailanthis glandulosa*, Desf. Tree of Heaven.
8. *Aesculus Hippocastanum*, L. Horse Chestnut.
9. *Aesculus glabra*, Willd. Ohio Buckeye.
10. *Acer saccharinum*, Wang. Sugar Maple.
11. " *dasycarpum*, Ehrh. White Maple.
12. " *rubrum*, L. Red Maple.
13. *Negundo aceroides*, Manch. Box Elder.
14. *Robinia pseudocacat*, L. Black Locust.
15. *Cercis Canadensis*, L. Red Bud.
16. *Gymnocladus Canadensis*, Lam. Kentucky Coffee Nut.
17. *Gleditschia triacanthos*, L. Honey Locust.
18. *Liquidamber styraciflua*, L. Sweet Gum.

19. *Cornus florida*, L. Flowering Dogwood.
20. *Nussa multiflora*, Wangenh. Black Gum.
21. *Dyospyros Virginica*, L. Persimmon.
22. *Fraxinus Americana*, L. White Ash.
23. " *viridis*, Michx. Green Ash.
24. " *quadrangulata*, Michx. Blue Ash.
25. *Catalpa bignonioides*, Walter. Common Catalpa.
26. " *speciosa*, Warder. Hardy Catalpa.
27. *Ulmus fulva*, Michx. Red Elm.
28. " *Americana*, L. White Elm.
29. " *racemosa*, Thos. Corky-barked Elm.
30. *Celtis occidentalis*, L. Hackberry.
31. *Platanus occidentalis*, L. Plane tree.
32. *Juglans cinerea*, L. Butternut.
33. " *nigra*, L. Black Walnut.
34. " *regia*, L. English Walnut.
35. *Carya alba*, Nutt. Shell-bark Hickory.
36. " *sulcata*, Nutt. Big Shell-bark.
37. " *tomentosa*, Nutt. Mockernut.
38. " *porcina*, Nutt. Pig-nut.
39. *Quercus alba*, L. White Oak.
40. " *macrocarpa*, Michx. Burr Oak.
41. " *acuminata*, Michx. Yellow Oak.
42. " *prinoides*, L. Rock Chestnut Oak.
43. " *nigra*, L. Black Oak.
44. " *rubra*, L. Red Oak.
45. " *palustris*, L., Du Roi. Pin Oak.
50. *Castanea vesca*, var. *Americana*. Chestnut.
51. *Fagus ferruginea*, Aiton. Beech.
52. " *sykatica*, L. European Beech.
53. *Betula lutea*, Michx. Yellow Birch.
54. " *alba*, L. European White Birch.
55. *Alnus incana*, Willd. Speckled Alder.
56. " *serrulata*, Aiton. Smooth Alder.
57. *Salix nigra*, Marshall. Black Willow.
58. " *alba*, L. White Willow.
59. *Populus tremuloides*, Michx. American Aspen.
60. " *alba*, L. Silver-leaved Poplar.
61. " *balsamifera*, L. Balsam Poplar.
62. *Pinus rigida*, Miller. Pitch Pine.
63. " *strobus*, L. White Pine.
64. " *sylvestris*, L. Scotch Pine.
65. " *Austriaca*, Endl. Austrian Pine.
66. *Juniperus communis*, L. Common Juniper.
67. " *Virginiana*, L. Red Cedar.
68. *Larix Europaea*, L. European Larch.

B. Loose seeds or on branches with leaves (owned by A. L.).

I. Oaks. These were kindly furnished by R. H. Warder, of North Bend, O. S. or acorns on branches with leaves :

1. *Quercus alba*, L.
2. " *obtusiloba*, Michx.
3. " *macrocarpa*, Michx.
4. " *bicolor*, Willd.

5. *Quercus castanea*, Willd.
6. " *primus*, L.
7. " " *var. palustris*, Michx.
8. " *nigra*, L.
9. " *rubra*, L.
10. " *coccinea*, Wangenh.
11. " *tinctoria*, Bartram.
12. " *palustris*, Du Roi.
13. " *Robur pedunculata*, Willd.

II. Cones on branches with leaves. These were kindly furnished by Mr. Wm. Salway, from Spring Grove Cemetery:

1. *Pinus rigida*, Miller. Pitch Pine.
2. " *inops*, Aiton. Jersey Pine.
3. " *Banksiana*, Lamb. Northern Scrub Pine.
4. " *resinosa*, Aiton. Red Pine.
5. " *strobos*, L. White Pine.
6. " *sylvestris*, L. Scotch Pine.
7. " *Austriaca*, Endl. Austrian Pine.
8. *Abies alba*, Michx. White Spruce.
9. " *nigra*, Poiret. Black Spruce.
10. " *excelsa*, L. Norway Spruce.
11. " *balsamea*, Marshall. Balsam Fir.
12. " *Douglasii*, Lindley. Douglas Spruce.
13. " *Canadensis*. Hemlock Spruce.
14. *Thuja occidentalis*, L. Arbor Vitae.
15. *Cupressus thyoides*, L. White Cedar.
16. *Juniperus communis*, L. Common Juniper.
17. " *Virginiana*, L. Red Cedar.
18. *Taxus baccata*, L. Yew.
19. *Larix Americana*, Michx. American Larch.
20. " *Europaea*, L. European Larch.
21. *Taxodium distichum*. Bald Cypress.

III. Magnolias (fruit on branches with leaves,) also from Spring Grove Cemetery, Cincinnati, O.:

1. *Magnolia acuminata*, L. Cucumber Tree.
2. " *glauca*, L. Sweet Bay.
3. " *grandiflora*, L. Evergreen Magnolia.
4. " *umbrella*, Law. Umbrella Tree.

IV. A branch of long-leaved pine with cone, sent by Dr. Carl Mohr, of Mobile, Ala.

V. Loose cones, from Dr. Carl Mohr, varying in size from that of a pea to one fourteen inches long, from American, European and Asiatic trees. This collection, together with that of A. L., constituted thirty-six species.

VI. In addition to the seeds enumerated, there was another collection in small bags, sown from the following firms:

Henry Nungesser, of New York, N. Y.
Lidney, Tuttle & Co., of Bloomington, Ill.

COLLECTIONS OF SECTIONS OF FOREST-TREES.

There were three distinct collections of wood-sections in the Forestry Department of the Ohio Exhibit; namely:

A. ADOLPH LEUE'S COLLECTION. A.

It consisted of wedge-shaped sections of forest-trees of North America. The specimens were nearly all of the same length, namely, *six inches*. Each specimen was planed at both ends to show the transverse section, and at both sides, to show the grain of the wood. One-half of one side was polished to show the finish, of which the wood is susceptible.

The following is a list of the species, arranged in the natural order :

Order : Magnoliaceæ.

Magnolia acuminata, L. Cucumber Tree.
Magnolia grandiflora, L. Evergreen Magnolia.
Liriodendron tulipifera, L. Tulip Poplar, Yellow Poplar.

Order : Ternstræmiaceæ.

Gordonia Lasianthus, L. Loblolly Bay, Tan Bay.

Order : Tiliaceæ.

Tilia Americana, L. Linden, Basswood, Lime Tree.
Tilia Americana, var. *pubescens*, Loudon. Whitewood.
Tilia heterophylla, Ventenat.

Order : Rutaceæ.

Xanthoxylum Americanum, Miller. Prickly Ash.

Order : Meliaceæ.

Melia Azederach.

Order : Sapindaceæ.

Aesculus glabra, Willdenow. Ohio Buckeye.
Aesculus flava, Aiton. Sweet Buckeye.
Acer macrophyllum, Pursh. Broad-leaved Maple.
Acer Pennsylvanicum, L. Striped Maple.
Acer saccharinum, Wangenheim. Sugar Maple.
Acer saccharinum, var. *nigrum*, T. & G. Black Sugar Maple.
Acer dasycarpum, Ehrh. Soft Maple, Silver Maple.
Acer rumbrum, L. Red Maple, Swamp Maple.
Negundo aceroides, Mœnch. Box Elder, Ash-leaved Maple.

Order : Leguminosæ.

Robinia pseudocacia, L. Black Locust.
Piscidia Erythrina, L. Jamaica Dogwood.
Gymnocladus Canadensis, Lam. Kentucky Coffee Tree.
Gleditschia triacanthos, L. Honey Locust.
Cercis Canadensis, L. Red Bud, Judas Tree.
Prosopis glandulosa, Torrey. Nesquit, Algaroba.

Order : Rosaceæ.

Prunus serotina, Ehrh. Wild Black Cherry.
Pyrus coronaria, L. Sweet-scented Crab.
Crataegus arborescens, Elliott. Haw.

Crataegus tomentosa, var. *punctata*, Gray. Black Thorn.
Amelanchier Canadensis, For. & Gray. June Berry, Service Tree.
Cowania Mexicana.

Order: Hamamelidaceæ.

Liquidambar styraciflua, L. Sweet Gum, Red Gum.

Order: Myrtaceæ.

Eugenia dichotoma, D. C. Eland. Naked Wood.

Order: Cornaceæ.

Cornus Nuttallii, Audubon. Flowering Dogwood.
Nyssa multiflora, Wangenheim. Tupelo, Sour Gum, Black Gum.

Order: Caprifoliaceæ.

Sambucus glauca, Nuttall. Elder.

Order: Ericaceæ.

Arctostaphylos pungens.

Order: Sapotaceæ.

Bumelia lanuginosa, Persoon. Gum Elastic.

Order: Ebenaceæ.

Diospyros Virginiana, L. Persimmon.

Order: Oleaceæ.

Fraxinus.
Fraxinus pubescens, Lamark. Red Ash.
Fraxinus viridis, Michx. Green Ash.
Fraxinus quadrangulata, Michx. Blue Ash.
Fraxinus sambucifolia, Lamark. Black Ash.

Order: Bignoniaceæ.

Catalpa bignonioides, Walter. Catalpa. Cigar Tree.
Catalpa speciosa, Warden. Western Catalpa.

Order: Lauraceæ.

Sassafras officinale, Nees. Sassafras.

Order: Euphorbiaceæ.

Stillingia sebifera.

Order: Urticaceæ.

Ulmus Americana, L. White Elm, American Elm.

**Ulmus racemosa*, Thomas. Rock Elm.

Ulmus alata, Michx. Wahoo, Winged Elm.

Celtis occidentalis, L. Sugar Berry, Hackberry.
Maclura aurantiaca, Nuttall. Osage Orange.
Planera aquatica.

Order: Platanaceæ.

Platanus occidentalis, L. Sycamore, Button Wood.

Order: Juglandaceæ.

Juglans cinera, L. Butternut, White Walnut.
Juglans nigra, L. Black Walnut.
Carya olivæ formis, Nuttall. Pecan Hickory.
Carya alba, Nuttall. Shell-Bark Hickory.
Carya sulcata, Nuttall. Big Shell-Bark Hickory.
Carya tomentosa, Nuttall. Mocker Nut. Black Hickory.
Carya porcina, Nuttall. Pig-Nut.
Carya amara, Nuttall. Bitter Nut.

Order: Cupuliferae.

Quercus chrysolepis, Liebmann. Live Oak, Valparaiso Oak.
Quercus agrifolia, Nee. Encero, Coast-Live-Oak.
Quercus Kelloggii, Newberry. Black Oak.
Quercus sonomensis, Benthem. Black Oak.
Quercus ilicifolia, Wangenheim. Tan-Bark Oak, Chestnut Oak.
Castanea vulgaris, var. American. A. Deland. Chestnut.
Fagus ferruginea, Aiton. Beech.
Ostrya Virginica, Willd. Hop Hornbeam, Iron Wood.
Carpinus Caroliniana, Walter. Hornbeam, Blue Beech.

Order: Betulaceæ.

Betula papyrifera, Marshall. Canoe Birch, Paper Birch.

Order: Salicaceæ.

Salix nigra, Marshall. Black Willow.
Salix longifolia, Muhlenberg. Sand-bar Willow.
Populus tremuloides, Michx. Aspen, Quaking Asp.
Populus grandidentata, Michx. Poplar.
Populus heterophylla, L. River Cotton Wood.
Populus balsamifera, L. Balsam, Balm of Gilead.
Populus monilifera, Aiton. Cottonwood, Carolina Poplar.

Order: Coniferæ.

Libocedrus decurrens, Torrey. White Cedar, Post Cedar.
Cupressus thyoides, L. White Cedar.
Juniperus Californica, Carriere. Juniper.
Juniperus pachyphloea, Torrey. Juniper.
Juniperus occidentalis, Hooker. Juniper.
Juniperus Virginiana, L. Red Cedar.
Taxodium distichum, Richard. Bald Cypress.
Taxus brevifolia, Nuttall. Yew.
Pinus strobus, L. White Pine, Weymouth Pine.
Pinus flexilis, James. White Pine.

Pinus edulis, Engelmann. Pinon, Nut Pine.
 Pinus monophylla, Torrey & Fremont. Nut Pine, Pinon.
 Pinus Torreyana, Parry.
 Pinus ponderosa, Douglas. Yellow Pine, Bull Pine.
 Pinus Jeffreyi, Murray. Black Pine.
 Pinus contorta, Douglas. Scrub Pine.
 Pinus Taeda, L. Loblolly Pine, Old field Pine.
 Pinus rigida, Miller. Pitch Pine.
 Pinus pungens, Michx. Hickory Pine.
 Pinus Coulteri, D. Don.
 Pinus mitis, Michx. Yellow Pine.
 Pinus glabra, Walter. Cedar Pine, Spruce Pine.
 Picea (Abies) nigra, Linck. Black Spruce.
 Picea (Abies) alba, Linck. White Spruce.
 Picea pungens, Engelmann. Blue Spruce.
 Picea Engelmanni, Engelmann. White Spruce.
 Tsuga Mertensiana, Carriere. Hemlock.
 Pseudotsuga (Abies) Douglassii, Carriere. Douglas Fir.
 Abies Fraseri, Lindley. Balsam.
 Abies Balsamea, Miller. Balsam Fir, Balm of Gilead.
 Abies subalpina, Engelmann. Balsam.
 Abies grandis, Lindley. White Fir.
 Abies concolor, Lindley & Gordon. Balsam Fir.
 Abies amabilis, Forbes. Fir.
 Larix Americana, Michx. Larch, Tamarack.

B. ADOLPH LEUE'S COLLECTION. B.

This collection also consists of wedge-shaped sections of forest-trees. The specimens differ from *collection A*, in that they are not quite so hand-somely finished. It embraced sixty species, which are not enumerated here, because most of them represent species of the first mentioned series.

C. COLLECTION OF ABNER L. FRAZER, CLERMONT COUNTY, O.

This was a very interesting collection, made on the farm of Mr. Frazer, at Newberry, in Clermont county, Ohio. It consisted of 45 species of forest-trees. The specimens which were prepared under the supervision of A. Leue, showed the trunk a cross-section, a split surface and a planed surface.

The collection passed by donation into the possession of the Technical School of Cincinnati.

D. AMERICAN WOODS.

Exhibited by actual specimens, prepared by Mr. R. B. Hough, of Low-
 ne, N. Y. The exhibit consisted of twenty-seven tablets representing
 fifty-five different species. Owned by A. L.

The design of this work is to show in as compact and perfect a manner as possible, authentic specimens of American woods. "For that end," says Mr. Hough, "three sections, respectively transverse, radial and tan

gentical to the grain, are made of each timber, sufficiently thin to allow in a measure the transmission of light, and securely mounted in well-made frames.

"The three planes above-mentioned show the grain from all sides, so to speak, no plane being possible but that would be either one of them or a combination of them."

Of each species, first the botanical name is given, then the English, the German, the French and the Spanish, thus:

Botanical—*Magnolia acuminata*, L.

English—Cucumber Tree, Mountain Magnolia.

German—Langgespitzte Magnolia.

French—*Magnolia a feuilles pointées*.

Spanish—*Magnolia acuminada*.

In the accompanying pamphlet entitled Hough's American Woods, Part I, the author describes the tree, its habitat, physical properties, uses, medicinal properties, and in some instances additional general remarks.

The work is of general interest, not only to the forester, wood-worker and botanist, but to every one who admires the beauties of nature.

The microscopic structure of woods is receiving considerable attention, and the literature on this subject is quite extensive. The following brief account of the microscopic structure of wood, as given by P. H. Dudley, in the Popular Science Monthly, in 1886, may serve to indicate the importance of this study :

An inspection of the different species shows the marked diversity in the structure and appearance of the woods, and one is quickly relieved of the general impression that they are all alike. Examined microscopically, the differences in structure are sufficient for identification of the species, and at the same time enable one to judge of the suitability of a particular wood for definite uses. So little has been done in this country in the microscopical study of the woods for engineering, architectural, or mechanical purposes, that but few are aware of the variety in form and structure of the wood-cells, ducts, and special fibers which make up the woody tissue of the different species. An expert can readily determine whether a certain wood, used for railroad-ties, will sustain the service of a trunk line, or is only suitable for a branch of limited traffic.

In the *Conifera*, which includes the pines, cedars, larches, red-woods, spruces and firs, as a rule, each layer of growth only has two kinds of wood-cells called tracheids, one of thin walls and a large lumen, and the other of thick walls and a small lumen; when the former predominates, making nearly all of the layer, the wood is generally soft, and in the white pine (*Pinus strobus*, L.), the cedars, red-woods, spruces and firs. When the thick-walled cells form one-fourth to one-half of the layer, the wood is much harder, as in the long-leaf yellow pine (*Pinus palustris*, Mill), *Pinus mitis*, and the larches. On the thick-walled cells of all the species of the *Conifera* are dome-like or lenticular markings, principally on the sides parallel to the medullary rays.

The thick-walled cells are often marked on the sides at right angles to the medullary rays. The *Conifera* have more or less resinous products, and the presence or absence of upright resin-canals aid in distinguishing the genera, while the form and character of the medullary rays, the presence or absence of resin-ducts, the character of the cells, enable

species to be identified. In the alburnum or sap-wood, the starch is confined to the cells around the resin-canals and in the cells of the medullary rays.

The cellular structure of the oaks, chestnuts, hickories, ashes, walnuts, maples, beeches, birches and magnolias is far more complex and more highly differentiated than that of the conifers; beside the wood-cells, there are ducts, vessels, and special cells containing starch in the alburnum or sap-wood. In nearly all the species of the first five orders mentioned, the ducts grow in concentric rows, in the first of the season's growth; those which form later may be inclined through the layer of wood-cells, becoming smaller as they approach the outer portion. In the live oak, the ducts run radially through the ring, and the small fibers are nearly solid, giving the wood great hardness, making it so valuable for ship-building.

E. PANELS.

There were also two series of large panels bought by the Ohio Honorary Commissioners.

(a.) A series made by Martin & Barris, of Cleveland, O., consisting of the following beautiful finished specimens, of Ohio woods, which are all of the uniform length, six feet, two inches.*

1.	Hickory, second growth, width.....	9 inches.
2.	Basswood, width	23 "
3.	Black Walnut, width.....	27 "
4.	Sycamore, quartered, width.....	13 $\frac{1}{2}$ "
5.	Yellow Poplar, width.....	35 "
6.	Red Cedar, width	14 $\frac{3}{4}$ "
7.	Hackberry, width	15 "
8.	Black Walnut, curled, width.....	10 $\frac{3}{4}$ "
9.	Black Oak, width.....	21 $\frac{1}{2}$ "
10.	Cottonwood, width	20 $\frac{1}{4}$ "
11.	Birch, width	15 $\frac{1}{2}$ "
12.	Black Walnut (duplicate of No. 3), width	10 $\frac{3}{4}$ "
13.	Red Oak, width	18 "
14.	Yellow Poplar, width	22 "
15.	Cherry, width.....	17 $\frac{1}{2}$ "
16.	Hickory, width	14 $\frac{1}{2}$ "
17.	Soft Maple, width	23 "
18.	White Ash.....	19 "
19.	Butternut.....	19 $\frac{3}{4}$ "
20.	Red Oak, quartered, width.....	16 "
21.	Honey Locust, width.....	12 "
22.	White Ash, second growth, width	11 "
23.	Burr Oak, width.....	15 $\frac{1}{2}$ "
24.	Hickory, second growth, width.....	13 "
25.	Hickory, second growth, (duplicate of No. 1) width.....	9 "
26.	Hickory, second growth, width.....	10 "
27.	Hickory, width.....	14 "
28.	White Oak, width	28 $\frac{1}{4}$ "
29.	Chestnut, width	24 $\frac{3}{4}$ "

(b.) A series of Ohio woods prepared by the Meader Furniture Co., Cincinnati, O. Alls all of uniform length, namely: Thirty-seven inches. It comprised the following specimens: †

* In displaying these specimens, no attempt at a proper classification was made. In enumerating them, I follow the order in which they were placed.—[A. L.]
Named in the order in which they were displayed.

1. White Oak, width	12 inches.
2. White Oak, quartered, width	12 "
3. Birds-eye Maple, width.....	10½ "
4. Sugar Maple, width.....	12 "
5. Sugar Maple, quartered, width	12 "
6. Soft Maple, width	12 "
7. Beech, width.....	7 "
8. Sycamore, quartered, width.....	12 "
9. White Ash, width	12 "
10. White Ash, (?) width (gray)	12 "
11. Cherry, width.....	11 "
12. Cherry, width.....	12 "
13. Black Walnut, width.....	12 "
14. Chestnut, width	12 "
15. Cherry, width.....	12½ "
16. Butternut, width	12 "
17. Yellow Poplar, width	12 "
18. Birch, width	12 "
19. Gum, width.....	10½ "
20. Basswood (Linden), width.....	12 "
21. Red Cedar, width	12 "

4. WOOD-ENGRAVINGS OF FOREST-TREES.

This collection consisted of the wood-cuts of forest-trees, made for the Arbor Day number of the Prairie Farmer, April 7, 1888. They were mounted on dark drawing paper and displayed on the wall.

5. LITHOGRAPHIC REPRESENTATION OF AUTUMN LEAVES.

Beautifully colored. They comprised six plates, taken from Forest-Leaves, a pamphlet by Mr. W. W. Johnson, of Snowflake, Michigan.

6. PHOTOGRAPHS.

(a) Views of woodland scenes in Hamilton and Butler counties, taken and presented by Dr. Hoeltge, and Mr. Edw. Muhlbery, of Cincinnati, O. (Ten different views.)

(b.) Photographs of groups of trees in Spring Grove Cemetery. (Exhibited by Mrs. Adolph Leue.)

7. ROOT HERBARIUM OF FOREST-TREES. (See Forest-Culture.)

FULL CROSS-SECTIONS OF TREE-TRUNKS.

These sections, which occupied a conspicuous place in the department, attracted considerable attention. They were of different lengths, and placed in an upright position, with a few exceptions. All were planed off at one end, so that the annual layers were plainly visible.

I. The following species were furnished by the E. D. Albra Company, of Cincinnati :

1. White Oak, 2 feet 4 inches in diameter.
2. Red Oak, 2 feet in diameter.
3. Black Gum, 2 feet 5 inches in diameter.
4. Black Walnut, 2 feet 6 inches in diameter.
5. Sugar Maple, 2 feet in diameter.
6. Cherry (wild block), 2 feet in diameter.
7. White Ash, 2 feet in diameter.

II. From Chas. F. Muth, of Cincinnati, the following specimens were obtained; all grew in Indiana:

1. Persimmon, 1 foot in diameter.
2. Flowering Dogwood, 10 inches in diameter.
3. Linden or Basswood, 1 foot in diameter.

III. From the Addyston Pipe and Steel Co., at Addyston, O., the following very interesting specimens were received :

1. Two sections (each about five inches in length, and two feet in diameter) of the American Chestnut, planted by the late Judge Short, on Short's Hill, Hamilton county, O., in the year 1840, showing forty-eight annual layers each.

2. A section of Pecan Hickory planted in 1839 by the late Judge J. C. Short, near Fernbank, Hamilton county, Ohio, with a diameter of two feet.

IV. In the same department were sections of Hackberry, Maple and Black Locust, contributed by Mr. John Windisch. These sections came from Mr. Windisch's farm in Butler county, O.

Of these, the Black Locust sections were of special interest, inasmuch as they showed the diameter of the tree at different heights. The sections were taken at intervals.

First section (1 foot in length), taken from near the ground, — inches.

Second section (1 foot in length), taken at intervals of 5 feet, — inches.

Third section (1 foot in length), taken at intervals of 5 feet, — inches.

Fourth section, (1 foot in length), taken at intervals of five feet, — inches.

The tree had been grown in a tolerably dense grove consisting of different kind of trees. The most remarkable thing was its soundness, and perfect freedom from injury by the locust-borer.

Near this grove, in fact, adjoining it, is an artificial grove, consisting of Black Locust; in it no sound tree is to be found. To show the insect ravages, a trunk of one of the trees of that grove was sent. It was cut and planed off to show the insect ravages more clearly than a mere glance at the trunk would reveal. It was completely honey-combed.

NEBRASKA TIMBER SPECIMENS.

Collection of Ex-Gov. Robt. W. Furnas, of Brownville, Nebraska.

The collection consists of narrow strips of timber, put up in a case fifty-three inches long, thirty and one-half inches high and twelve inches deep, with a glass cover. Just above the case hung a framed diagram, showing the names of the woods in the case. The following label speaks for itself :

"TIMBER SPECIMENS—Both indigenous and introduced, grown and growing in Nebraska since the extinguishment of Indian title to lands, 1854. The collection was made to show the feasibility of growing valuable varieties of timber in a region of country by nature destitute. In this collection are 138 distinct different varieties, collected by and under supervision of Ex-Gov. Robt. W. Furnas. Inland work by Mr. J. T. Corbett. — by Mr. Robt. Johnson, Brownville, Nebraska."

FOREST-ZOOLOGY.

CATALOGUE OF BIRDS AND MAMMALS IN THE FORESTRY EXHIBIT.

I. BIRDS.—COLLECTION OF ADOLPH LEUE.

Sialia sialis, Linn. *Eastern Bluebird.*

Very common summer resident in middle and northern Ohio. Resident in small number throughout the year in the vicinity of Cincinnati (Langdon). Breeds.

Pyranga rubra, Audubon. *Scarlet Tanager.* (Male bird.)

Very common summer resident. Breeds. Arrives in the latter part of April, remains till the latter part of September.

Ampelis cedrorum, Gray. *Cedar Bird, Cherry Bird.*

Usually abundant resident. Breeds.

Plectrophanes nivalis, Meyer. *Snow Bunting.*

Irregular winter visitor, common in northern Ohio, but rare in the middle and southern portions of the State.

Goniaepha Ludoviciana, Bowditch. *Rose-breasted Grosbeak.*

Common summer resident in northern Ohio, chiefly migrant in southern and middle Ohio, where remain and breed. (Dr. J. W. Wheaton.)

Xanthocephalus icterocephalus, Bd. *Yellow-headed Blackbird.*

Accidental. Only one instance of its appearance in Ohio is recorded by Dr. Wheaton.*

Sturnella magna, Linn. *Meadow Lark.*

Abundant. Summer resident in northern, in part resident in middle, but less numerous in winter in southern Ohio.

Cyanurus cristatus, Sw. *Blue Jay.*

Abundant resident, but less numerous than formerly.

Tyrannus Carolinensis, Temm. *Kingbird, Bee Martin.*

Abundant summer resident. Breeds. Arrives late in April and remains till the middle of September.

Hylotomus pileatus, Baird. *Pileated Woodpecker, Logcock.*

Not common. Resident in most parts of the State. It is reported that forty years ago it was a very common bird in all parts of the State.

Picus villoso, Linn. *Hairy Woodpecker.*

Rather common resident, more frequent in fall, winter and early spring than in summer. Breeds.

* Geological Survey of Ohio, Vol. IV, p. 356.

Sphyrapicus varius, Baird. *Yellow-bellied Woodpecker.*

Common, spring and fall migrant in March and April, October and November. This bird is reported to injure trees by stripping off its bark.

Melanerpes erythrocephalus, Sw. *Red-headed Woodpecker.*

Abundant summer resident. Few remain in middle Ohio throughout the year.

Colaptes auratus, Sw. *Golden-winged Woodpecker, Flicker.* (Female bird.)

Abundant summer resident, and in part resident during the whole year throughout the State.

Bubo Virginianus, Bp. *Great Horned Owl.*

Common resident. Breeds. Its food consists of small quadrupeds such as rats, mice, squirrels, occasionally rabbits, birds, reptiles and fish.

Scops asio, Bp. *Screech Owl, Mottled Owl.*

Common resident, but more numerous during the warmer portion of the year. Breeds. Feeds on large insects, mice and small birds.

Otus vulgaris, var. *Wilsonianus*, All. *Long-eared Owl.*

Resident, common in winter, rare in summer. Forests of evergreens are said to be the favorite resorts of this species for breeding purposes.

Nyctea scandiaca, Newton. *Snowy Owl, White Owl.*

Common visitor in northern Ohio, more rare and irregular in middle and southern Ohio. It feeds upon rabbits and partridges, and also upon fish.

Ectopistes macrura, Cones. *Wild Pigeon.*

Formerly an extremely abundant summer resident and migrant, appearing in all seasons. Now, much less abundant and irregular.

Cupidonia cupido, Bd. *Pennated Grouse, Prairie Hen.*

Rare resident in northwestern and central Ohio. Probably breeds.

Philohela minor, Gr. *American Woodcock.*

Very common summer resident from March to October. Breeds.

Ardea virescens, Linn. *Green Heron.*

Abundant summer resident from April 1 to October. Breeds.

Porphyrio martinica, Temm. *Purple Gallinule.*

Rare in spring. Uncertain whether it breeds in this State.

Mereca Americana, Steph. *American Widgeon.* (Female bird, summer plumage.)

Abundant spring and fall migrant.

Querquedula discors, Steph. *Blue-winged Teal.*

Abundant spring and fall migrant, not common summer resident in northern Ohio.

Aix sponsa, Bode. *Summer Duck, Wood Duck.*

Common resident, common migrant. Breeding throughout the State.

Anas glacialis, Leach. *Long-tailed Duck.*

Common winter visitor on Lake Erie, and rare in the interior of the State.

Mergus cucullatus, Linn. *Hooded Merganser.*

Rare common spring and fall migrant.

Colymbus torquatus, Brunn. *Loon, Great Northern Loon, Diver.* (Male bird, fall plumage). Common spring and fall migrant and winter resident.

[In addition to the above collection of birds, there was another which belonged to Mr. Lee, of Lancaster, of which no catalogue could be obtained. The collection consisted of about fifty species, some of which were not in good condition.]

II. MAMMALS.—COLLECTION OF ALBRECHT LEUE.

The collection of mammals consisted of—

1. ^{1/2} Stuffed specimens:

- a. Common Weasel. *Putorius erminea.*
- b. Western Fox Squirrel. *Sciurus ludovicianus.*
- c. Northern Gray Squirrel. *Sciurus cinereus.*
- d. Striped Ground Squirrel. *Tamias striatus* (two specimens).

2. Skulls:

- a. Dog; three varieties, viz.: New Foundland, Bull Dog and the common dog.
- b. American Red Fox. *Vulpes vulgaris Pennsylvanicus.*
- c. Raccoon.
- d. Squirrel (gray).
- e. Rabbit.
- f. Goat.

3. Antlers:

A pair of antlers of the European Deer.

BIRDS' EGGS.

[Collection of Frank Raschig, pupil of the Ninth District School, Cincinnati, O.]

This collection, which was chiefly made in West Virginia, was arranged in a neat black walnut case 18 x 18 inches, with a glass cover. It contained eggs of—

The Crow	4 specimens.
The Purple Crackle.....	8 "
The Wood-thrush.....	3 "
The Flicker.....	4 "
Brown thrush	6 "
Chewink	3 "
King-bird	3 "
Cat-bird	1 specimen.
Red and Duff-shouldered Blackbird.....	1 "
Swamp Sparrow	3 specimens.
Chipping Sparrow.....	4 "
Song Sparrow.....	4 "
Tudigo-Bunting	1 specimen.
Snow-Bunting	2 specimens.
House-Wren	1 specimen.
Not named	3 specimens.
Total.....	51 "
Snapping turtle	1 specimen.

There was another interesting collection of Ohio birds and mammals secured by Wiley, of Lancaster, O. No catalogue of the same could be obtained.

THE MAY-BEETLE OR COCK-CHAFER.

Lachnostenra quercina, Knoch.

Of this insect, Prof. William Saunders, of London, Ontario, says: *

"Everybody must be familiar with the May-beetle, or May-bug, as it is sometimes called—a buzzing beetle, with a rapid, but wild and erratic flight, which comes thumping against the windows of lighted rooms at night, in May and early in June; and where the windows are open it dashes in without a moment's consideration, bumping against walls and ceilings, occasionally dropping to the floor; then suddenly rising again, it sometimes lands unexpectedly against one's face or neck, or it may be on one's head, where its sharp claws get entangled in the hair, and its further progress is stayed until a forcible removal takes place. At such times, it is quite a terror to those whose nerves are weak. Although thousands of these summer-evening tormentors are yearly, yea, nightly, trodden to death during their brief season, yet thousands of others rise to supply their places, and sometimes they are re-inforced by armies of tens of thousands. Then it is that oftentimes serious damage is done to trees whose foliage they consume, their powerful and horny jaws being admirably adapted for cutting and grinding the leaves. Cherry trees are frequently injured in this way; indeed these beetles are not at all particular as to what they eat—the oak, the Lombardy poplar, and many other kinds of trees, are just as readily attacked, if in their way."

In this connection Prof. Saunders quotes an article in the *Canada Farmer** from which we clip the following:

"This insect has been long and most invariably known as very destructive to vegetation, both in its larval and winged state. In the former it is commonly called the 'white grub'; it is then a soft white worm, with a brownish head, and six legs, becoming, when full grown, about as large as one's little finger. It is usually found partially coiled up near the root of the plant on which it is feeding. Unlike many of our destructive insects, the devastations of each individual are not confined to a single year, but it continues several years in the grub state, and, finally, changes early in the spring into a dark chestnut brown beetle, nearly an inch long, with rather long legs, and its breast covered with yellowish hairs. It flies about at night with a loud buzzing noise, and in a most clumsy manner, as if it had very little control over its movements, to the great discomfort and perturbation of nervous persons, especially when attracted into houses, as it often is, by the light. Its period of flight is usually limited to the months of May and June, though it is sometimes met with a little later in the season. The grubs are very commonly dug up, early in the spring, in gardens, in various stages of maturity; the plough, too, brings many more to the light of day. It is hardly necessary, we suppose, to tell our readers, that in such cases they should be destroyed at once, and without mercy, by treading under foot. The perfect insect may be collected and put an end to, by shaking them from the trees they infest, into a cloth spread beneath for their reception, and then throwing them into boiling water; the specimens thus cooked will be readily eaten by pigs, which, in fact, root up and devour multitudes of the grubs without waiting for any previous culinary operations. The best time to shake them from the trees is early in the morning, when they become sluggish and torpid, their flight being confined to the hour of darkness.

"The larva of this beetle," Mr. Saunders continues, † "does not by any means confine attention to strawberry roots, but devours potatoes, corn and other vegetables, also the roots of grass, and this to such an extent that at times meadows are utterly ruined by them, so that the turf may be turned up like a carpet, so utterly are the roots consumed.

*Annual Report of Agriculture, for the Province of Ontario, for 1872, p. 384.

†*Canada Farmer*, July, 1866, by Rev. C. J. S. Bethune.

"After the pairing of the sexes, the males soon die, while the females burrow into the ground some six inches or more, where they deposit their eggs from fifty to a hundred in number, after which they come out again from the earth, but their mission having now been completed, they soon die. The eggs soon hatch into white grubs, which begin at once to feed on the roots of any plant within their reach. During the summer, they burrow about and feed not far from the surface; but as winter approaches, they dive deeper into the soil, below the reach of frost, where they remain torpid until spring. At the close of the third summer they cease feeding, and bury themselves sometimes two feet deep in the earth, and there, in an oval cavity, formed by the motions of the larva from side to side, the change to chrysalis takes place, the beetle digging its way through and appearing at the surface in due season. Sometimes the transformation to the beetle state takes place in the fall, for we have several times found fresh specimens at this season, showing by their softness that they had but lately escaped from the pupa case. Such perfect insects secrete themselves under ground during winter, and appear with the rest of their troop in spring.

“Remedies: Man can do but little towards checking the ravages of this insect pest, but nature has provided many means for keeping them within due bounds. Some birds, such as the crow and common fowl, eat them greedily, indeed the crow may often be seen following the track of the plow in search of these choice morsels. As already stated, pigs eat them with avidity, and will root up the ground most thoroughly in their search for them, and no doubt many other insect-eating animals and birds eat them with equal delight. These grubs are also liable, in some parts, to the attacks of a peculiar disease, which manifests itself in the development of a fungus growth, which sprouts out in a curious manner from about the head, and the result is death of the insect so occupied. The beetles, as already stated, may be best destroyed by shaking them from the trees and throwing them into scalding water."

THE LADY-BIRD BEETLE.

About this peculiar insect, of which there are over a thousand species, Prof. A. J. Cook, of the Michigan Agricultural College, says:

"I have watched these beetles closely for years. I have never seen them attack vegetables of any kind only last season (1886). We have reared these valuable insects right in our laboratory. The eggs are laid on the twigs of the trees. The grubs are exceedingly predaceous; they feed on plant-lice, leaf-roller larva, etc., in fact, on very many of our most destructive insect pests. This is no guess-work; we have seen the actual attack and destruction. When fully grown, the pupa state is formed on the same twigs where the grubs have feasted on lice, etc.; soon the beetles come forth, and again the eggs are laid. Quite likely the insects have never left the tree at all. How then about the pig-sty manure theory.[†] We had twigs in our laboratory so thickly covered with the pupa of these *coccinellidæ*, that they remind one of fruit on a stem, like currants.

"We cannot too highly prize these beetles. All have noticed how thick the plant-lice often are on our various fruit-trees in early May; it is also as well understood that usually the lice are so few in June that we may hardly find any; the lady-bird beetles—the same spotted little insects—have wrought the change. While this is the most striking benefit received from these valuable friends, yet it is not the only one, for, as already said, it do not take very close observation to find that nearly all our injurious insects, are in like manner, preyed upon and devoured by these same little orange or yellow beetles."

[†] p. 385.

[†] It is held by some, that these insects breed in pig-sty manure, and that the use of such manure is to be avoided.—[A. L.]

FOREST CULTURE.

An interesting object in this division was the model of a forest-tree-planting machine. One-fourth of its original size exhibited by B. E. Fernow, of Washington, D. C.

This machine, it is claimed, has planted, in *nine* hours, 15,272 Ash seedlings four feet apart, with the help of one driver and one feeder, on new ground. Trees planted by this machine in 1886, on raw prairie, are, it is said, now making better growth than those planted by hand in subdued ground. *Can* plant 40,000 to 50,000 trees per day.

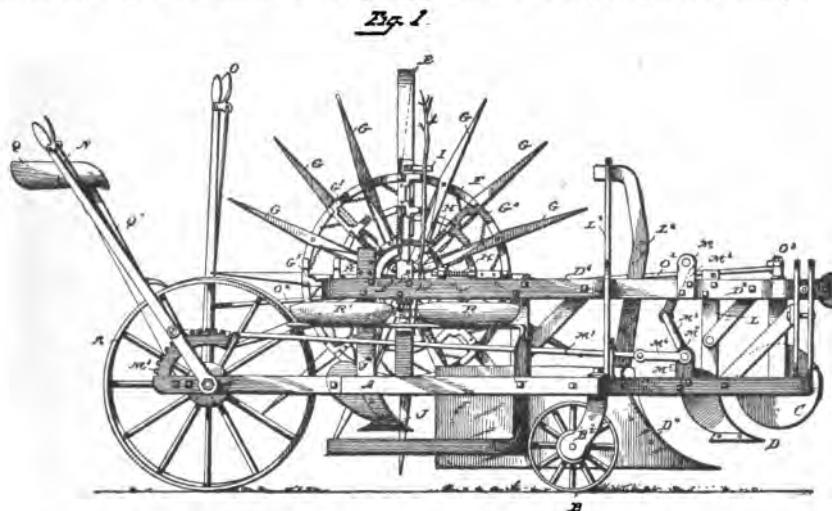
The machine was photographed and then sent to the Columbus Exposition, and a photograph retained in this exhibit.

The machine is applicable also to tobacco-planting.

As to the history and mode of using this machine, I quote:

[From advance sheets of the Annual Report of the U. S. Commissioner of Agriculture for 1888.]

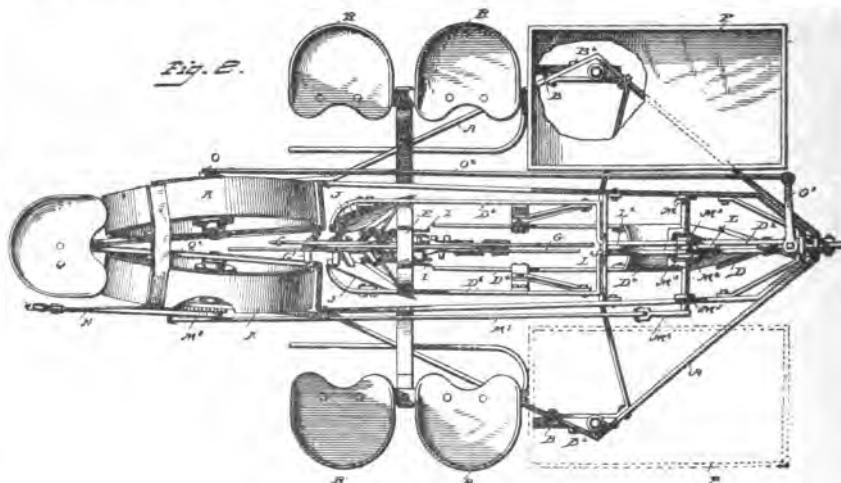
Thomas A. Stratton, a farmer near Lincoln, Nebraska, originally from the Buckeye State, having a tree claim in Southwestern Nebraska, at Stratton, seventy miles west of the 100th meridian, found himself in the spring of 1886 with 100,000 two and three-year-old



ings on hand, and no chance of hiring the labor for planting the same. He devised constructed the tree-planter with his own hands, and begun planting on April 17, 1886, with the aid of one man, and five horses abreast, the entire 100,000 trees in eight days, most of the ground being unprepared, a small part only having been backset.

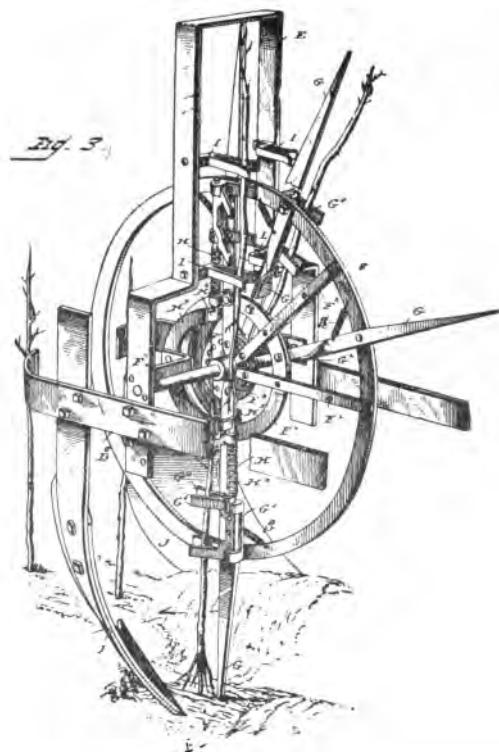
The 22d of April was Arbor Day, and Mr. Stratton set 11,200 trees, handling every tree himself in order to obtain the premium "for the greatest number planted by one man." Of these, according to affidavit of witnesses, 95 per cent. were alive and growing in October of the same year, (See Annual Report Nebraska State Board of Agriculture, 1886, p. 49), and are now (1888) in thrifty condition. On other days, when driver and feeder changed hands, as many as 15,000 trees were set, and with the improvements since made, one man has set in nine hours 15,272 Ash seedlings—on Arbor Day, 1888. With more help and further improvements, now made, the machine will be capable of preparing ground and planting in a thorough manner, from 20,000 to 30,000 plants or more.

The machine is drawn by five horses abreast. The coulter and coulter-plow cuts the



prairie sod in advance of the large furrow plow, which opens a furrow six inches wide (or wider if wanted), and from ten to fifteen inches deep, the depth being regulated by means of a lever operated by the driver, and the furrow being kept open by extension of the landsides. By the side of the planting wheel, which is propelled by walking on the ground as the machine moves, are seats for the feeders, and by their side are boxes for carrying plant material enough to plant a row half a mile long, four feet apart. The plants are fed to grapples acting automatically or clamps attached to the planting-wheel. The distance of the plants is regulated by the number of grapples on the planting-wheel which are being used. In the new machine the grapples on each spoke, which are to receive the plants, are kept open by means of a disk and springs, until they pass a given point on the upper side of the wheel; before this is reached the plant is inserted with the roots pointing upwards into a holder, where it is found by the grapple which takes it up and closes, holding the plant until it is brought around and down into the furrow, when the grapple opens automatically and drops the tree. At that moment, two shovels following closely, fill soil around the plant and close the furrow. The hind wheels represent two six-inch face rollers, set somewhat obliquely to press the earth firmly against the plants. The superior success of the planting by this machine on raw prairie as against ordinary methods on prepared ground, which has been observed, must be ascribed to these rollers, which bring roots and soil in closest contact—the most essential requisite in tree-planting a most especially in a dry climate.

It is of course not necessary, as was done in the first instance, to plant into the raw prairie, although this experience has shown that it can be done successfully. The best



plan would be, where the ground is light and dry and covered with Buffalo grass, as in the western parts of Nebraska and Kansas, and in Eastern Colorado, to cut the sod in the spring as soon as the ground is in condition, and break the ground with a coulter plow following with disk harrow, to break the sod fine and do the planting at once in trenches, or with the tree-planter.

ROOT HERBARIUM OF FOREST-TREES.

By a forestal root herbarium is meant a collection of roots of forest-trees at different stages of growth, designed to show the ramification of the roots. As a means of illustration and instruction in practical forestry, such an herbarium is of the greatest importance, for the roots of trees indicate not only the soil they need for the development of the trees, but can also show the kind of cultivation a tree requires.

The collection which was on exhibit in the Ohio Forestry Department, was the first of the kind ever shown in this country, and very deservedly attracted the attention of all interested in practical forestry. Unfortunately the want of proper space and light prevented it from being seen to the best advantage. Many, and especially the larger specimens, could not be placed at all. To properly display the collection, gathered for this Exposition, one hundred and sixty square feet wall space was needed, while only fifty feet could be, and were devoted to this display.

One of the great objects of this collection was to show the difference between nursery-grown trees and trees from self-sown seeds in our natural woodlands.

The collection contained specimens at the age of *one, two, three and four* years, and embraced forty different species.

MODEL OF AN OAK-COPPICE FOR TAN-BARK.

This very ingenious model, which attracted a great deal of attention, was, at my special request, made by Mr. F. W. Reiber, of Columbus, Ohio, a man well acquainted with this branch of forest industry, as in vogue in Germany. The model shows a miniature oak-coppice in three different stages:

1. The forest unpeeled;
2. A section of the same as it appears when being peeled;
3. A section cleared.

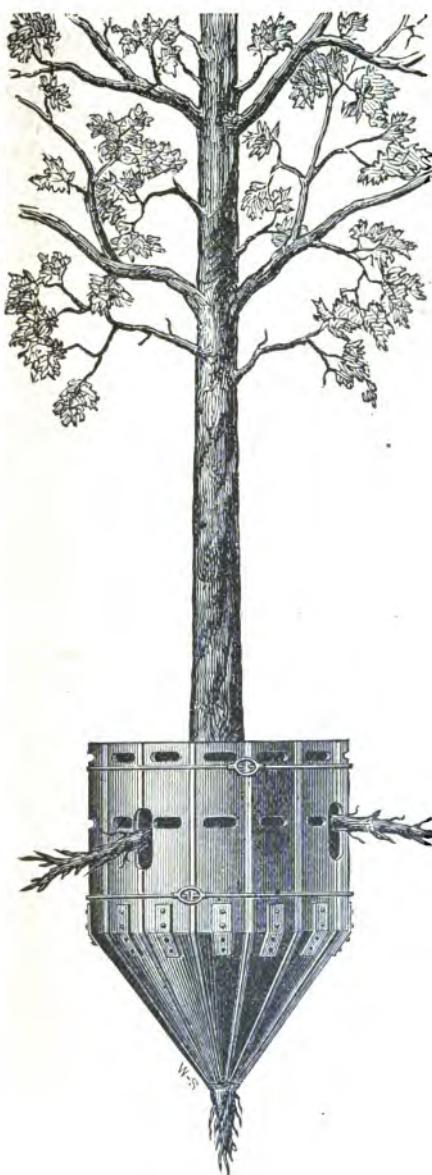
The methods of peeling, and the hurdles on which the peeled bark is cured, were well illustrated.

In connection with this model, implements used in peeling were shown. These consisted of the following:

1. A trimming-knife;
2. A bark-peeler;
3. A hammer.

The knife and the peeler which I had made at Columbus, Ohio, were of the best steel, and made for this exhibit.

TREE TRANSPLANTER.



During the progress of the Exposition, words regarding the Stanley & Gulley Tree Transplanter reached us. Immediate efforts to secure such a device, or a model thereof, for the forestal exhibit failed. Later inquiries developed the fact, that the machine has been used with marked success in western cities, notably in Fort Worth, Texas, Dallas, Texas, and in St. Louis, Mo. In these places trees of from 7 to 15 inches in diameter are said to have been transplanted with perfect success.

Although it will never come into use for forestal purposes proper, it certainly will find application in transplanting trees for ornament and shade, as in parks, yards, and along streets; as by it a pleasing effect and good shade can be secured immediately.

According to the size of the tree, from 1,000 to 20,000 pounds of soil is moved with the tree when taken from the woods or nursery, and is held intact by this device, as shown in the accompanying cut.

All the fibrous roots within a radius of two feet, to a depth of from four to six feet, remain undisturbed.

THE EUCALYPTUS.

Blue-gum Tree of Australia.

This tree was represented by a stem 15 feet in length and $1\frac{1}{2}$ inches in diameter at the base, and three-fourths inches at 15 feet from base. It is said to be the product of twenty months' growth, and was grown at San Diego, California.

Although much has been said about this wonderful tree, the following resume* of its peculiarities will be of interest in this connection:

"Not only in the malarious regions of the Southern Mississippi, but in other portions of the South and West, the *Eucalyptus globosus*, or blue-gum tree of Australia, is being abundantly planted, and the result will undoubtedly be a great increase in the healthfulness of those localities. Malaria is the curse of the river regions of the South and Southwest, rendering many portions of the most fertile of them practically uninhabitable, and this condition the *Eucalyptus* has a magical power of correcting. Travelers tell us that some of these trees reach a height exceeding that of the pyramids. If one of them stood beside St. Paul's in London, it would cast a shadow on the gilded cross above its dome. They grow from a little germ not larger than a mustard-seed, and enough may be sent in an envelope to plant a forest. When the tree is in blossom, it emits a resinous odor, and in all its stages of growth it is a potent corrective of infectious airs. Planted in the Maremma or the poisonous Campana, or in the marshes of Algiers, it draws from the earth its noxious moisture, and from the air its pestilential miasma, and translates them into a wholesome and pleasant fragrance grateful to the sense as odors of terebinth or myrrh. Providence has hardly bestowed on man a more useful forest growth. It adapts itself to all soils and climate, but thrives best where it is most wanted, in regions where malaria prevails, and where the conditions of atmosphere and soil are prejudicial to health.

"They are, doubtless, the highest trees in the world, overtopping even the colossal red cedar of Nevada. A competent authority affirming that they frequently reach a height of five hundred feet. This dwarfs all trees—the Baobabs of Teneriffe, the great chestnut of \mathbb{A} etna, the Brazilian fig, and the pines of Puget Sound. There are two kinds of these trees, both equally valuable in correcting malarial conditions of the soil, but differing in the nature of their products, one of them producing a species of red resin valuable in commerce, and the other a febrifuge which is thought to be a good substitute for quinine. There are probably a good many places in the East where these magnificent growths might be planted to advantage."

* *Farm and Fireside*, July 15, 1885.

FOREST TECHNOLOGY.

SHOE-PEGS.

Shoe-pegs, made of white and silver birch, are not considered to be as good as those made of white maple. Only the best selected bodies of trees are used. "The wood," says the *Wood-Worker*,* "is cut and hauled as wanted, the sap-wood only being utilized, and the heart or red part removed and thrown away."

"A New Hampshire shoe-peg manufacturing firm that produces 40,000 bushels annually, uses second-growth birch, a quick-growing timber; and it has been found that the supply equals the demand in the peculiar section where the mill is located. The wood is worked green and seasoned in process of manufacture. A shoe-peg goes through 18 different hands or processes before it reaches the market and is placed on sale, and 75 per cent. of cost is for labor.

"There are ten shoe-peg factories in the United States, employing about 300 hands, having a capital of \$175,000. While in the near past a large quantity of pegs were imported from England, we now export to that, as well almost all other European countries, in large quantities. Shoe-pegs range in price from 35 cents per bushel for those called two-eighths, up to 95 cents for eight-eighths. The shoe-peg industry is a growing one."

MAP-ROLLERS AND MOULDING—FEATHER-DUSTER HANDLES.

By courtesy of Mr. M. P. Mason, of Carthage, N. Y., a series of map-rollers and feather-duster handles were placed in this collection.

About these articles Mr. Mason says:

"I send samples of map-rollers and mouldings, two feet long, of different sizes—in block-finished on wood, and in natural wood color, with knobs and without. The rollers and mouldings are made from Bass-wood, and the knobs from soft Maple. I also send you specimens of the feather-duster handles. I make those with long-grooved heads for the key dusters. After the hard portion of the feather is split off, to make them flexible, are assorted and put into the grooves, the largest, or tail-feathers, on the outside of the er. The handles are made from soft maple, and the heads from Bass-wood. They are stained and then polished by hand with Shelac-polish, and the more they are handled better they will look. The handles, with the heads full of holes, are for 'Ostrich dus-' The feathers are glued in with block pitch. I send some in the polished, and some ie unpolished state."

WOODS USED IN THE MANUFACTURE OF CARRIAGES.

A. HUBS.

1. From the Standard Wagon Company, Cincinnati, O.:
 - a. A large hub of Rock Elm, length, $13\frac{1}{2}$ inches; largest circumference, $31\frac{1}{2}$ inches.
 - b. Two smaller hubs (for buggy), made of Black Birch, from New York.
 - c. Two hubs of the same size, made of Yellow Birch, from Indiana.
2. From the Royer Wheel Company, Cincinnati, O.:
 - a. White Elm blocks, for hubs. One not roughed, one roughed.
 - b. A series of four pieces, showing the hub in the various stages of manufacture.
 - c. Sections of hubs.
 - d. A hub from the Osage Orange, especially made for this exhibit.
3. From the Defiance Machine Works, at Defiance, O.:
 - a. A sample hub of White Elm; size, 9 inches in length and $21\frac{1}{2}$ inches in circumference.
 - b. A half section of the same kind of hub.
 - c. A smaller (buggy) hub of White Elm.
4. From the Columbus Buggy Company, Columbus, O.:
 - a. Section of Rock Elm, for vehicle hub.
 - b. Section of Shell-band wheel-hub, wood being Elm.
5. From a large Black Locust hub, about 18 years old. For more than 16 years this hub was used as a show-piece, standing on the sidewalk in front of the store in all kinds of temperature and weather, and still it is perfectly sound.

B. SPOKES.

1. From the Royer Wheel Co.:
 - a. Rough spoke (split hickory, second-growth.)
 - b. Finished spoke (second-growth hickory.)
 - c. The same kind, broken to show the toughness of timber.
 - d. Rough spoke (second-growth oak.)
 - e. Finished spoke (second-growth white oak.)
2. From the Defiance Machine Works:

An English sharp-edge spoke of White Oak, turned on the Company's automatic spoke lathe, at the rate of 3,000 per ten hours; turning and squaring performed at one operation.
3. From the Eagan Machine Company, Cincinnati, O.:

An oak spoke.
4. From the Columbus Buggy Co.: 6 pieces, show the spoke (second-growth hickory) in the various stages of manufacture, from the green spoke-stock to the finished spoke; one being broken to show the toughness of stock.

C. RIMS AND FELLOES.

1. From the Royer Wheel Co.:
 - a. Rim-strip, for bending (second-growth hickory.)
 - b. Bent rim, in rough.
 - c. Bent rim, finished.
 - d. Sawed felloe. (White Oak.)
2. From the Columbus Buggy Co.:

Section of wheel-rim (hickory), with a section of spoke (hickory).

The following letter from the Columbus Buggy Company, regarding the handling of timber for buggy and carriage manufacture, is of more than ordinary interest. The firm writes:

DEAR SIR: We enclose memorandum of the way we handle timber, as made out by the foreman.

In the cutting and curving of carriage material, the manufacturer has to give the utmost care as to detail to avoid bad results. In the case of hub-stock for wheel, for instance, the stock has to be cut in the right season, which is from September to January, when the sap has fully developed into wood, and the acid of the sap is at its minimum. If cut out of season, the timber is apt to sour and mold, and its usefulness is destroyed. The Columbus Buggy Company has its stock cut in season, and the bark removed, and cut to proper length. The ends of the wood are then dipped in a preparation of tallow and resin, to exclude the air, which prevents the wood from checking. The wood is then racked for a period of ten months, and during this time rehandled twice, and any mold that may be found on it is carefully brushed off. After the expiration of ten months, the wood has passed through what is known as the sweating process, and is now stored away in closer racks, where it remains for over two years. It is then put into a dry-house, where it remains for about three or four weeks, in a heat of from 95 to 100 degrees Fahrenheit. The blocks are then turned to shape and sizes required; after which they are placed into a warm room, where they remain for about 10 or 12 days; then they are ready for use.

The timber for spokes and rims is subject to the same treatment, except as to time required to season, which is from 12 to 14 months' air-drying, and 10 to 12 days in the dry-house, at about the same temperature as required for hub-stock.

This Company carries 12 to 14 months' supply of spoke-stock, and 3 to 4 years' supply of hub-stock, and 12 to 18 months' supply of gear and body stock in its yards and sheds at all times to insure properly seasoned and cured stock, using the latest improved dry-houses, which experience has proved practical.

A very important factor in making carriage and any other kind of timber durable, is the felling in the right season of the year, when the sap is ripe.

A very formidable enemy against which the manufacturer has to contend, is the grub or worm in timber, especially in the second-growth or young tough hickory.* It would be a great benefit to all users of timber, if some effectual remedy could be suggested. These insects are frequently found on what appears to be first-class stock. Any one who may find means to put an end to these ravages will merit the gratitude of suffering humanity.

Respectfully,

THE COLUMBUS BUGGY CO.

COLUMBUS, October 7, 1887.

SHINGLES.

Only four specimens of as many different woods were shown, namely: California Red Wood, Red Cedar, White Cedar or Cypress, and White Pine.

—

A red wood shingle is the most ornamental, and its being expensive only used in ornamental roofing. The wood, which is quite durable, oily inflammable, and easily worked, is well adapted for shingles.

*amples of such worm-eaten timber, more especially of oak, hickory and ash, were on exhibit
"ry Department. A. L.

Heretofore red cedar was considered the best wood for shingles. But the great demand upon this wood for various purposes has caused the supply to become limited, and therefore red cedar shingles are scarce.

The white cedar furnishes an excellent shingle, and is bound to become popular, when its qualities shall be fully understood. The following extract from the Chicago Timberman is of more than ordinary interest in this connection :

"In view of the rather short stock of pine shingles in the Northwest, it appears a little singular that there is not a better demand and a better price realized for cedar shingles. These shingles have been in market a long time, but it is to be confessed that they make but slow progress. They do not sell as readily as pine, and they do not bring quite the same price, yet they are better shingles beyond a doubt. Men experienced in the business are puzzled that these superior articles, to be had at a lower price, do not take the place of more pine shingles that, costing more, do not answer the purpose so well, and are not nearly as durable. It is possible that the fact that cedar shingles are cheaper than pine may have something to do with their comparatively small sale. With a good many consumers the only guide to value is the price, and they would be very likely to infer from the fact of the uniform difference in the cost, that there is a corresponding difference in their actual value. And probably another reason why cedar shingles are not popular, is that in many districts they are practically unknown. Local dealers are not apt to take up every new thing of the kind that comes along, and frequently it has happened, where they have been induced to try an order of cedar shingles, that they have been unable to turn them over satisfactorily, because their customers have been entirely unacquainted with their merits. * * * It is conceded that the white cedar of the North produces a shingle that can not be surpassed even by the Southern cypress. As a roofing material it is infinitely superior to pine, and where its merit is once appreciated, there is very little sale for the latter."

White pine shingles come mostly from Michigan, and are said to be of a quality much inferior to those of former years, though the specimen on exhibit was exceptionally fine.

Among other trees, which are occasionally used for shingles, the most prominent are the Southern cypress, the oak, the chestnut, the yellow poplar.

OARS AND PADDLES—SADDLE-TREES—HAMES—NECK-YOKE.

OARS AND PADDLES.

A. Set of oars and paddles manufactured and presented by Mr. J. H. Rushton, of Canton, N. Y.:

1. Two pairs of spoon-oars made of spruce, one in the rough state the other be fully finished.
2. Two double-blade canoe paddles made of white pine, one in the rough the other finished.
3. Two hunting-paddles made of rock maple, one in the rough the other finish

B. A series of paddles and oars manufactured and presented by Messrs. Von Behren & Shafter, of Stryker, O.,* consisting of—

1. A pair of oars made of ash.
2. A pair of spoon-oars made of spruce, with leather and rubber-band, beautifully finished.
3. A pair of oars made of spruce, with leather and rubber band, beautifully finished.
4. Three hunting-paddles, beautifully finished.
 - a. Largest size of spruce.
 - b. Medium size of buckeye.
 - c. Smallest size of maple.

This last series were arranged in a neat white pine case, lined with red muslin.

SADDLE-TREES.

A series of saddle-trees manufactured and presented by Miller & Buchanan, of Cincinnati, consisting of—

1. A saddle-tree-fork, made of white oak.
2. A side-bar of sugar maple.
3. A saddle-tree-cantle of white oak.
4. A saddle-tree of white oak.
5. A saddle-tree, the cantle of which is of tulip poplar.
6. A dray saddle-tree of white oak.
7. Sections of white oak and sugar maple rough, and in a wedge-shaped form, as used in the manufacture of side-bars.

HAMES.

A series of hames manufactured and presented by — — —, of Cincinnati, Ohio. Rock elm is considered the best wood for hames, and is almost exclusively used by the firm. The exhibit consisted of four pieces, of which one was finished.

NECK-YOKE.

Only one sample in the collection, and this was presented by the Cincinnati Neck-Yoke Co. It is made of second-growth hickory. The heart-wood of older trees is too brittle.

INDURATED FIBRE WARE.

The Indurated Fibre Ware Manufactory, may be called a wood-saving institution, and as such it deserves the attention of the friends of forestry,

This firm exports annually thousands of white ash oars to Europe, most of which to England and Germany and France.

while, on account of the great utility of the articles manufactured and their comparative cheapness, this peculiar industry is of interest to everybody.

The Indurated Fibre Co., of New York City, which has seven factories located in various parts of the country, kindly contributed to the exhibit, a series of articles consisting of:

1. A wash-tub.
2. A milk-pail.
3. A milk-pan.
4. A slop-jar.
5. A waste paper jar, a beautiful imitation of a tree-trunk.
6. A series of what is called a star-pail, in the various stages of manufacture. (Six pieces.)
7. A battery jar.
8. A tube.

Every one of the above mentioned articles is of one piece, without joint or seam.

The American Rural Home, in speaking of indurated fibre ware, says:*

Man's first food vessels are nature's gift, the shells of the sea, and of fruits, the bark of the trees, the skins of animals. As he emerges from his primitive state, he carves out his household utensils from wood, and plastic mother of earth, he dexterously shapes into the graceful urn and water pitcher. As he conquers the metals, we have the bronze of the ancients carved to the envy of our modern artists. The nineteenth century, however, brings the rapid growth and development of this industry. As civilization calls for utensils of every shape and variety for household purposes, the inventive genius of the Yankee is invoked, and a "Yankee notion" evolved.

Ever since wood pulp was utilized in paper, it has been a constant study of more than one Yankee, to mold it into shape for household utensils. With this successfully accomplished, the next problem was treatment, which should render the ware serviceable, strong, and at the same time impervious to liquids.

Indurated fibre ware, although it has been on the market little over a year, has warranted the location of six factories already in the United States: At Portland, Me.; Watertown, Mass.; Mechanicsville, N. Y.; Oswego, N. Y.; Lockport, N. Y., and Winona, Minn., with a capital invested of over a million dollars.

The process of manufacture, briefly described, is as follows: The pulp employed is produced by grinding a log of knotless, resinless wood against a rapidly revolving grind-stone, a constant stream of water being supplied. This pulp, as a mass of white fibre substance is pressed into the shape desired by the aid of an enormously powerful hydraulic machine. The roughly formed article is thoroughly dried, smoothly turned in a lathe, and finally sand-papered to a fine finish. A chemical treatment is then forced into every pore and it is placed in a hot kiln and baked for several hours. It is again sand-papered and redipped, baked and sand-papered, this operation being repeated several times, finishing with a final baking at a temperature of 280 degrees, coming out the handsomest, toughest and most durable article imaginable.

Pails or buckets were the first articles produced in this ware, and the several factories turn out of these, about 500 dozen per day, aside from the numberless other articles made. The ware has a beautiful polished surface, resembling the natural woods, and varying in

* American Rural Home, July 25, 1887.

color from a light chestnut to a deep mahogany. The pail requires no hoops, consequently as the sides and bottom are all one piece, the bottom can never drop out, nor the pail drop to pieces. It will carry hot or cold water and never "soak" or become foul. It will never warp or shrink. It is light, neat and cleanly, and owing to its non-absorbing character, it will never, as every other pail in dairy use, sour, and for this reason it can be employed for any purposes where other pails would become offensive.

A variety of pails are now manufactured, large and small. The "Star" or twelve-quart pail being the standard for household purposes, and the milk, fire and stable pails for specific uses. Wash-tubs made of this material, possess all the virtues of the pail, and will be appreciated by everybody. They will never become heavy and never leak. They are warranted to stand the use of the wringer. The old-fashioned keeler or "piggin" condemns itself also. There are several sizes of these made and they are very serviceable as dish-pans, bath-tubs for children, foot baths, etc.

Every farmer's wife takes pride in her row of shining bright milk-pans, and these she can have of the indurated fibre; being seamless, there are no joints for the cream and dirt to gather in, and they require only a sousing in hot water and suds to make them beautifully bright and sweet. A further fact in favor of the milk pans—being made of wood, a non-conductor of heat, milk will by actual test, keep sweet six to twelve hours longer than in tin. There is no fear of tainting the milk, as the ware will not impart taste to the most delicate contents. Butter and bread bowls of this ware possess the advantage over the old-fashioned wooden bowls of being very much lighter, and of never checking or splitting.

Wash-basins of this ware are a godsend where there are children, as they will stand all manner of abuse, cannot rust and do not water-soak.

Of this material spittoons are also made, more serviceable than any other line of ware produced. Slop-jars, waste paper jars, measures, umbrella stands (hand decorated, a most artistic article), and water-coolers. The field is almost unlimited.

BASKETS.

A series of baskets, consisting of—

A bushel basket made of what is known by the trade as branch willow, with samples of the willow.

A small market-basket, made of what the trade calls Welsh willow, with samples of the willow peeled.

A number of baskets made of split woods, viz.: elm, birch and white pine.

Basket willow-culture in Europe is quite remunerative; in this country it has not received the attention it deserves. A few attempts at cultivating the basket willow have been made, but in several instances the enterprise has been abandoned, partly, as there was no market for the product, and partly for want of laborers.

In June, 1886, the New York Sun contained a very interesting article on the subject of baskets, from which the following extract is taken:

"The first important increase of the basket industry in this country grew out of the extensive planting of willows, by Col. Colt, of Hartford, Connecticut. These willows were

planted chiefly to supply roots to hold together the big dykes built by Col. Colt for the reclamation of marsh lands, but the willows thrived so well that the branches became a valuable commodity. As the old world process of removing the bark of the willow without staining the wood was not well known here, the earlier American products were in the form of dyed and varnished baskets.

"Since that time there have been many signal changes in the business, chief among which are the introduction of machinery and the use of split woods, chiefly of oak and elm, from which the largest, cheapest and strongest baskets are now made. There is one establishment in Northampton, Mass., probably the largest in the world, where they turn out about eight thousand a day, comprising nearly sixty varieties, and employing two hundred hands. Most of these are used for fruit, vegetables and berries, and are made so cheaply that dealers can afford to sell their commodities almost without taking the value of the basket into consideration. In the peach business, for instance, it was formerly a large part of the risk of the business to keep track of the baskets. Now, strong peach baskets holding a bushel are made at about eleven cents each, so that the buyer may use the basket for kindling-wood if he sees fit. The same is true of grape baskets, which are made as low as four-and-a-half cents each, and are preferable to the paper or wooden boxes. * * * Fine willow baskets are very durable if kept moist. If they are allowed to get dry they are liable to crack. * * *

"Speaking in general, it is true that baskets are cheaper and better than they were formerly. You can now buy a basket for fifty cents as good as one that formerly cost two or three dollars. As in all other industries, the ingenuity and forethought of Americans have put a good deal of brains in the basket business, and there is yet room for greater enterprise and improvement."

TOOTH-PICKS.

A small box of tooth-picks, obtained by purchase, were placed on exhibit. Attention to the manufacture of the "handy little splinters" has been called in former reports of this bureau.* The following account is given by *The Timberman* (Aug. 25, 1888).

"A tooth-pick factory is one of the flourishing wood-working establishments at Harbor Springs, Mich., and it is one of the largest factories of the kind in the country. White Birch is exclusively used in the manufacture of tooth-picks, and about 7,500,000 of the handy little splinters are turned out daily. The logs are sawed up into bolts each twenty-eight inches in length, then thoroughly steamed and cut up into veneer. The veneer is cut into long ribbons three inches in width, and these ribbons, eight or ten of them at a time are run through the tooth-pick machinery, coming out at the other end, the perfect pieces falling into one basket, the broken pieces and the refuse falling into another. The picks are packed into boxes 1,500 in a box, by girls, mostly comely-looking young squaws, and are then packed into cases, and finally into big boxes, ready for shipment into all parts of the world. The white birch tooth-picks are very neat and clean in appearance, sweet to the taste, and there is a wide market for them. The goods sell at the factory at \$1.90 a case of 150,000 picks, or 100 small boxes, each containing 1,500, and the small boxes retail at five cents each, or 300 picks for a cent, at which almost everybody can afford to take a fresh tooth-pick after each meal."

The *Wood-Worker* says in an article on a tooth-pick factory: †

* Second Annual Rep. Ohio State Forestry Bureau, p. 9.

† *Wood-Worker* Oct., 1887, p. 16.

"At Belmont, New York, is located the factory of the Empire Tooth-pick Co. A local paper, describing the facilities of the company, and its methods of manufacture, says:

"They have six acres of land, and the manufactory building is 150 feet long by 50 feet wide, with four working floors, and have a separate stone building for engine and boiler, some 30 feet square, the boiler being 100-horse power, and engine 75-horse power, which drives their line shaft with a 20-inch belt. The basement floor is used for preparing the maple timber for the hard-wood tooth-picks. The logs are brought into the room on a car, and taken to a sawing machine, where they are sawed into bolts four inches in length, when they are taken to a boring machine and a one and a half-inch hole bored in the center, then to a rousing machine, where they are planed smooth around the outside, where the bark came off, which prevents any short picks or small pieces being cut, and insures perfect and first-class goods. This room is also used for the line shafting and storage-room for poplar bolts. The second or ground-floor is divided into three rooms, each fifty feet square. The south room is used for the manufacturing of cases exclusively, and here are made all the cases in which their large production is packed. In this room they have a circular box board saw-mill, edger, planer, table-saws and mailing tables, and all conveniences for the cheap and fast production of cases.

"The second room on this floor is used for the manufacture of tooth-picks. At one side are located the two large iron machines that produce the hard-wood picks. These machines are very complicated and expensive, the knives in one head alone costing \$120. The bolts that have been prepared below are elevated and thoroughly heated in tanks of hot water, then taken and placed upon the spindle of the machine and made secure; they then revolve, and the three heads to the machine that carry the knives feed up automatically, cutting the picks, which come from the machine in a large stream. These two machines have a capacity of 3,000 boxes per day of No. 1 flat hard-wood tooth-picks.

"On the opposite side of this room is the large log machine that cuts the ribbons for the soft-wood picks. This machine takes logs thirty-seven inches long and up to forty inches in diameter. The log is placed in the machine between the centers, and made secure by clutches that are forced into the ends, and these are made fast to the shaft of the large revolving gear-wheels which revolve the log, the large knife feeding up to the log automatically, and directly over the knife is the spur-bar that carries twelve small knife spurs, which score the log and divide the veneer into ribbons of three inches each, the correct width for the picks. These ribbons are then taken to the chopper which stands by its side, into which they are fed from twenty to thirty ribbons at a time. This chopper makes three hundred strokes per minute, and cuts from twenty to thirty picks each stroke, and has a capacity of 2,000 boxes per day. The third or front room on this floor is the packing-room, and is bordered on two sides by packing tables. In this room there are working from ten to fifteen girls, and an expert packer can pack from eight to ten cases per day, for which they are paid twenty cents per case.

"The picks are lowered through shoots from the third floor where the drying-rooms are located, upon the tables for the packers, who, by a few motions of the hands acquired by practice, are able to fill a box with each successive handful, which is done with wonderful facility. In the same room is the printing press, where all the boxes have the labels printed upon them before packing. This is also manipulated by a girl, as they are so much quicker and give better satisfaction than boys. On the third floor are the drying-kilns and store-room for unpacked goods, and the fourth floor is also used for the same purpose. The picks are carried from the ground floor to the drying-rooms in carriers, resembling those used in flour mills to elevate flour, and are handled altogether with pitchforks, the same as hay or straw. The main building or factory is heated with steam, and no fires nearer than the boiler-room, which makes it practically safe from fires.

"This firm employs from twenty-five to thirty hands, and have a capacity of 5,000 boxes or more per day. They pay cash for white poplar timber, sugar maple and pine, the latter being used for cases. Recently the firm made a shipment of 235 cases, which would aggregate 58,750,000 tooth-picks, which looks like a large amount, but it is not much over

four days' production. They now have orders booked for London, England, and Sydney, Australia."

Efforts to ascertain the amount of timber used annually by this firm have been without result. But judging from the quantity of tooth-picks produced it must be much in excess to that used by the factory in Maine, mentioned at the beginning of this article.

The Manufacturer and Builder, speaking of the "Tooth-pick Industry in Maine," says:*

"The National Tooth-pick Association, which controls the production of tooth-picks as the Standard Oil Trust does petroleum, has contracted for enough tooth-picks to be made in Maine the coming year to load a freight train of fifty cars. Before next June five billions of tooth-picks will be shipped out of Maine. A good sized wood-lot will thus be split up to go into the mouths and vest pockets of the American people."

WOOD-CARPET.

During the first few weeks of the Exposition, a few samples of wood-carpet, obtained by purchase, were on exhibit, and then taken out to make room for other material.

Wood-carpets are coming more and more into use, and the manufacture thereof promises to become quite an important industry, of which the *Sawmill Gazette*† gives the following account:

"The manufacture of wood-carpet is a developing industry in this city. There are but four wood-carpet factories in the United States. For several years after parquetry flooring was introduced into the United States, John W. Boughton, of Philadelphia, and L. Benedict, divided the wood-carpet business of the United States between them. Mr. Benedict uses oak, maple and ash largely, though the finer woods, such as walnut, cherry, mahogany, rosewood and ebony, are worked into the finer makes. Of oak alone, about 200,000 feet a year is consumed. Ash and maple are next in amount of consumption.

"The use of wood-carpet is constantly on the increase, and there is scarcely any limit to the prospects for it. This kind of floor-covering can be made so as to sell as cheaply as a good quality of ingrain, or it can be so wrought in with costly woods as to sell for \$1, or more, a foot. Good oak, ash and maple carpet can be sold at between eighty and ninety cents a yard. Finished in oil, it is good enough for any ordinary use. For wainscoating and ceiling it is admirably adapted.

"The process of making wood-carpet is comparatively simple, though the work must be done with exactitude. Carefully adjusted saws strip the lumber into the desired thickness and width, the latter differing according to the work required. The stuff is then subjected to the saws that cut it out in proper shape for inlaying, to form the fabric and figure of the carpet. This must be done with much particularity, as each of the multiform pieces must exactly fit. The arrangement of the pieces and the gluing of them is done by lads, and looks like slow work, but yards are thus woven with fair celerity. Canvas is glued on one side to give strength to the fabric. The carpet is then subjected to sandpaper, and is finally finished with hard oil. The designing of wood-carpet is tedious and expensive.

* Vol. XIX., No. 12 (Dec., 1887), p. 265.

† *Sawmill Gazette*, October, 1887.

Sometimes the manufacturer devises and works out a pattern at great expense, only to find that it does not suit the popular taste, and must be thrown aside. The popularity of woods also fluctuates, as it does in interior finish. Plain white oak carpet is now very salable, because it is cheap, finishes well, and is of lasting quality."

COOPERAGE.

I. HOOP-POLES.

Several sections of hoop-poles (Hickory) were shown. For want of space, a series of full-length poles, and hoops in the various stages of manufacture, which a manufacturer was ready to donate to the Forestry Department, could not be placed on exhibit.

The following article, by Mr. George Fisher,* is of special interest in this connection:

COOPERAGE WOODS.

"There is a department of cooperage woods that many of our readers have paid but little attention to. In fact, so common and every-day an article as a hoop-pole, attracts but little attention; in consequence, but few are familiar with it, both as an article of merchandise and the service that this small pole performs. The flour, pork, lard and hogshead hoops are made principally of Hickory. It would strike not a few of our readers as a rather novel employment to cut and haul hoop-poles for a livelihood, yet it is followed by hundreds of people. It is a vocation followed by the poorer classes. It might be said that the hoop-pole was used 'to drive the wolf from the door,' as the poor man's last extremity.

"The hoop-pole is cut principally from sections of country where the soil is very poor, stony or hilly, in many instances a combination of all three. It is only by the most rigid economy that the people in these sections of the country dig out a scanty living. Every avenue has to be resorted to to make both ends meet. After the fall work is laid by, the industrious farmer, or owner of this rough land, resorts to the woodland and cuts the straight young hickory saplings or poles, ranging from $1\frac{1}{2}$ inch to three and four inches at butt. It is slow, tedious work, especially as they grow usually in thickets, where it is difficult for a man to get through on foot, much less for a team to drive through. This renders it necessary for the man cutting them to gather them into bundles or carry them out in his arms to a point accessible with teams. They have to be cut after the sap has gone down, or nearly so, which is from the first to the fifteenth of August. They can be cut from this time until the first of June the next spring, but most coopers will not take them cut after the sap begins to rise in the spring.

"The country merchant who finds money scarce, buys almost anything that he can find a market for, and among other things which he barteres with, is the subject of our article. There is usually a market for them somewhere, and at quite a uniform price, so that a car-load of good hoop-poles can be marketed quite as readily as a carload of wheat, corn, bacon or any other staple article of merchandise. The price paid for the poles, rough, unshaved, is \$4, \$4.50, and rarely \$5 per thousand. Being small, a good team will haul 800 to 1,000 poles, but the poor man who usually follows this, like his land, has a poor team to work his farm, and 600 makes him what he styles a good 'jog.' It is not an uncommon thing to see a teamster, with a load of poles, that he has hauled 10, 12 or 15 miles. Usually, though, where the poles are that far from the shipping point, they are split and shaved; by this means from 1,000 to 1,500 can be hauled, and are, often even 20 miles over a rough road

* Wood-Worker, November, 1887, p. 16.

that would impress our readers as being fully worth the full price of the poles to haul them alone.

"There are several kinds and varieties of poles. The flour barrel uses a very light hoop, usually about $7\frac{1}{2}$ feet long and often as small as $\frac{1}{2}$ -inch at the small end of the hoop. Pork barrel hoops are cut 8 feet long, and from 1 inch to $1\frac{1}{4}$ -inch at top. Lard tierces, 8 feet long, and $1\frac{1}{2}$ -inch at the top, or small end of the hoop. Hogshead, 9 to $9\frac{1}{2}$ feet long, and from one inch to $1\frac{1}{4}$ -inch at small end. Some cut them as long as 10 and 11 feet. It is not an uncommon thing for poles to be worked that will make three and four hoops to the pole.

"A very noticeable feature of the hoop-pole section is that they grow so rapidly that in three or four years after a timber tract has been cut clean of the poles, a second crop is waiting for some one to cut them. It is impossible to exhaust the hickory hoop-poles, and, as we have explained, hauled as far as they are, it is virtually enabling coopers to draw their supply 40 miles or 20 miles each side of the track. This covers a very large area of country.

"The cut or machine hoop is fast supplanting the hickory hoop, not as a superior hoop, but in point of cheapness when they can be used. Cheap classes of cooperage work demand the cheapest material, and the world is making some progress in this direction, as well as in many others."

Another writer, Wm. Thomas, of Columbia, Mo., writes on the subject of hoops, as follows: *

"I find it a very difficult matter to give any satisfactory information concerning the manufacture of flour barrel hoops in this part of the country, outside of my own experience, as most all other dealers buy their hoops principally from country merchants.

"But an insight into the manner in which these hoops are made may be of interest. I have noticed for many years, in passing through the country, that at nearly every log-cabin through northern Missouri and southern Iowa was to be found a small pile of hoop-poles, and I was much interested and amused to find the whole family busy at work of making hoops. The good mother would be engaged in knotting and splitting the poles open at the top end, the children splitting them completely, while the father, long-haired and wearing a beard uncombed since the civil war, would sit on his shaving-bench near the fire-place, thus serving both as fuel and light. At the end of the week, they would deliver their hoops to some convenient country market, and exchange them principally for bacon and meal; the merchant or dealer buying them low enough to secure himself against any decline in the hoop market. Thus it can be readily seen that the shaver received but very meager compensation for his labor. And thus it has been that inferior hoops were introduced into the market, and many a skillful laborer caused to stop the manufacture of hoops entirely, as skilled workmen could not afford to work for the meager compensation received."

Wherever it can be done, the hickory hoop-pole is discarded and hoops made of logs of the soft or water elm. Michigan has probably more elm hoop factories than any other State. Early in 1886 one such factory was started in Manistee, Michigan, which a correspondent of the Northwestern Lumberman describes thus:

"The logs are of soft or water elm, and are cut with a drag saw to six feet and six inches, and then are steamed for about forty-eight hours in large iron tanks. When sufficiently softened they are taken to the machine and hung on centers, as if in a lathe, and a knife moving back and forth on a cross-head, similar to that of an engine, cuts off a hoop at each stroke, the log being revolved and fed automatically until the heart is reached, which is

* Northwestern Miller.

cut up for fire-wood. As the hoops drop from the machine they are sorted, the perfect ones to go to the planers and the bad to be cut for nail kegs, if they will make that size, or if not to go to the furnace. The planers take three hoops at once and level them and then the hoops go to the machine, which points and lays them all at one motion. The finished hoops are then put into vats of boiling water, and are made into coils of ten each, ready for the market. The machine ordinarily makes eighty-five hoops a minute, but it is said it can be run up as high as one hundred and five a minute."

II. STAVES AND ARTICLES OF COOPERAGE.

This division, though not large, contained a great variety of articles showing the application of wood in this important industry. It is to be regretted that no Ohio firm responded to a call for contributions to the collection which was mostly obtained by purchase.

A fine collection of articles was kindly contributed by the Creamery Package Manufacturing Co. of Portland, Indiana. It consisted of a series of butter-tubs and butter boxes. The butter-tubs are chiefly made of white spruce and white ash, the former by machine the latter by hand. The difference between hand-made and machine-made tubs is set forth in the following letter from the superintendent of the firm, who writes:

Machine-made tubs are made from sawed staves, tongued and grooved and turned outside and in like a pail; they are considerably heavier when dry than the hand-made tub, varying about one pound for the 60-pound tub. They are inclined to leak badly, and will break the hoops to such an extent that they will not stand much soaking before filling; therefore the brine is drawn from the butter next to the tub into the pores of the wood, many times spoiling the butter, and especially so when held in cold storage any length of time. As a proof of this, commission men seldom put butter in cold storage when packed in turned tubs. They will pay from one-half to one cent more per pound for butter when packed for this purpose in hand-made creamery tubs. These are used most largely in the Eastern States, because the hand-made tub has never been introduced. Only grocerymen use them to any extent in the West, and that for low grades of butter only.

Hand-made or creamery tubs are made from staves cut from steamed bolts, heated and trussed into shape by power-trusses, thus giving strength and durability to them; they are hooped by hand with great care and made with tight joints; these are far better fitted for holding the brine than the loosely built machine-made tub. They will not break the hoops to any extent even when soaked twenty-four hours. They will weigh less when dry than machine-made tubs, but when properly soaked ready for the butter they will tare about the same as the above. The hand-made tubs may not be quite as smoothly finished, nor have as nice appearance before using as turned tubs; but they will always arrive in the market in better condition than the above after long shipments. They are far better adapted for preserving the butter, and will give better service every time, and when once in use will never be discarded for the old style machine tub. They are used exclusively in the Western States by all creamery and dairymen, and will soon be used universally.

Respectfully submitted.

CREAMERY PACKAGE MFG. CO.,
Portland, Jay Co., Indiana.

Another, and indeed fine contribution of articles of cooperage was received from Mr. W. L. Robinson, of New Haven, Conn., which gave a

fine illustration of the adaptedness of various woods in cooperage. It consisted of:

1. An oyster pail made of white oak—hoops of iron.
2. " " spruce— "
3. A butter-tub of American spruce— "
4. Russian sardine keg, of which—
 Staves are of sugar maple from New York.
 Heads are of white ash from Michigan.
 Hoops are of maple from New York.
5. Two Anchovy kegs and several other smaller articles made of various kinds of wood.

Mr. Riedemann, of Wade street, Cincinnati, donated a series of staves in the rough and in the finished state. He manufactures whisky, wine and beer kegs, and uses the following kinds of wood, which comes from Indiana: White oak, red oak, pin oak, burr oak.

It is a very notable fact that many of the fine white oak trees of the northern and northeastern parts of our State are cut into staves, and exported chiefly to Europe.

A great many staves used in Southwestern Ohio, come from Kentucky. Manufacturers inform me that the price of staves is about double of what it was before the war, and they look with serious apprehension to the day when the supply shall be exhausted.

Many articles of cooperage are being supplanted by the indurated fibre ware.

THE KINDLING-WOOD INDUSTRY.

It would be impossible to even approximately ascertain the amount of wood used in the United States annually, for kindling-wood. The idea, to raise trees for the purpose of ultimately bringing them into the market to be sawed and split into kindling-wood, by some people would be considered sufficient reason to question the sanity of the man who entertains it. And yet, we venture the assertion, that the time will come, and that, too, in a not distant future, when kindling-wood coppices will prove to be a well-paying branch of forestry. In villages and country towns, the probability of the future existence of such a branch of forestry, may not be apparent; but not so in large cities where the kindling-wood question is even now one of considerable importance, as will appear from an article published in the New York Sun in September, 1887, which is as follows:

"At the corner of 18th street and Avenue B, New York, is located one of the largest kindling-wood factories of the world. The factory can turn out seventy cords of wood per

day, sawed, split, and ready for the burning. Oak, pine and hemlock are fed to singing buzz-saws and insatiable chopping knives. The hickory is brought from the northern part of this State, and from Connecticut and Pennsylvania. It is mostly burned in open fires, and is cut in pieces from eight to forty-eight inches in length. Hickory is worth \$18 per cord piled in the cellar. Five vessels, with a combined capacity of 1,275 tons, are constantly employed bringing pine from Virginia to the factory. These vessels make twenty trips during the year.

"The oak is grown in the State of Connecticut, and the hemlock comes from the lumber districts of New York State. Hemlock is brought to this city in strips about four feet long and one and one-half-inch squares. These strips are put into a machine run by steam, which, at one revolution of sixteen saws, cuts them into pieces three inches in length. These pieces are then dumped into a big wooden hopper, around the edges of which are ranged benches. Into the benches are set oval iron machines, operated by steam by means of a treadle.

"Men are paid at the rate of twenty-five cents a hundred bundles for forming the wood into bundles, and tying it with a tarred rope. The machine presses the pieces of wood so closely together, that the rope often cuts into the wood. Six hundred bundles a day is considered a fair day's work for a man, although an exceptionally quick workman has been known to put 800 bundles together. Over one of the machines hangs this legend:

‘We work for cash,
And not for fun,
And want our pay
When the work is done.’

"Upon a rail hangs a dilapidated tin-pail, which hides this warning:

‘This can is not to be lent outside of this shop. The can is never rusty inside.’

"The wood in the bundles sold in the grocery stores, containing pieces nine inches in length, is cut with the buzz-saw, and fed into a machine, which carries the sawed pieces under a knife like the letter X. This knife cuts as much wood in fifteen minutes as a darky could chop in a day."

CANES.

The cane manufacturing interest was not as well represented in the Forestry Department as the importance of this industry demands. Instead of the two quite large collections of canes, which were promised, but which, for want of suitable space could not be placed on exhibit, there was but one single specimen of this commodity of cane-bearing man in the entire department.

The cane manufacturing industry is one of considerable extent. The amount of forest-products needed to supply the demand of this industry, is sufficiently large to merit the attention of the farmer. The wood utilized in the manufacture of canes and umbrella sticks consists, as a rule, of the stems of young trees, mostly grown from the stump, although the first thinnings of seed-forests may be used for this purpose.

Cane-coppices, or a forest raised for the production of cane material,

may be cut every one or three years according to the trees grown. Odd corners, and land too wet for the production of the ordinary farm crops, may be turned into such coppices.

"The manufacture of canes," says a writer, "is by no means the simple process of cutting the sticks from the woods, peeling off the bark, whittling down the knots, sand-papering the rough surface, and adding a touch of varnish, a curiously carved handle or head, and tipping the end with a ferrule. In the sand flats of New Jersey, whole families support themselves by gathering nannyberry sticks, which they gather in the swamps, straighten with an old vise, steam over an old kettle, and perhaps, scrape down or whittle into size. These are packed in large bundles, shipped to New York City, and sold to the cane factories. Many imported sticks, however, have to go through a process of straightening by mechanical means, which are a mystery to the uninitiated. They are buried in hot sand until they become pliable. In front of the heap of hot sand in which the sticks are plunged, is a short board from five to six feet long, fixed at an angle inclined to the workman, and having two or more notches cut in the edge. When the stick has become perfectly pliable, the workman places it on one of the notches, and, bending it in the opposite direction to which it is naturally bent, straightens it. Thus, sticks apparently crooked, bent, warped and worthless, are, by this simple process, straightened. But the most curious part of the work is observed in the formation of the crook or curl for the handles, which are not naturally supplied with a hook or knob. The workman places one end of the cane firmly in a vise, and pours a continuous stream of fire from a gas-pipe, on the part which is to be bent. When sufficient heat has been applied, the cane is pulled slowly and gradually round, until the hook is completely formed, and then secured with a string. An additional application of heat serves to bake and permanently fix the curl. The under part of the handle is frequently charred by the action of the gas, and this is rubbed down with sand-paper until the requisite degree of smoothness is attained."

SPOOLS.

Only a few samples of spools were on exhibit, and these had been used. An effort to obtain samples in the different stages of manufacture had failed.

The manufacture of spools is quite an industry, as will be seen from the following article which appeared in a Cincinnati periodical in 1878:

"Drummondsville is situated on the St. Francis River, and the northern division of the Southeastern Railway, Canada, passes through it. Several years ago the prevailing wood which grew in the vicinity was white birch, which does not, we believe, make first-class fire-wood, but which appears to be best for the manufacture of spools. This probably was the reason why Drummondsville was selected as the place in which to locate these factories, and the farmers in the vicinity can always find a ready market for this kind of wood at about \$3.00 per cord. The wood, after being delivered to the factories, is first sawed into pieces about four feet long and from an inch to an inch-and-a-half square, according to the size of the spool it is destined to make. These pieces are put into a dry-house and thoroughly dried, from whence they are taken to the factory and given to the 'roughers,' who, in an incredibly short space of time, bore a hole in the center a couple of inches deep, turn about the same space round, and then cut off the length required for a spool. The machines used for this purpose are revolving planers, in the center of which is a revolving

gimlet or bit, and immediately to the right a small circular saw with a gauge set to the proper size for the spools.

"The 'roughers' receive a cent-and-a-half per gross for their work, and experienced men can turn out from one hundred to one hundred and thirty gross per day. The round blocks pass from them to the 'finishers,' who place them in machines which give them the shape of spools and make them quite smooth. It is quite interesting here to notice the men at work. A man stands with his left hand upon a small lever, and with the right he places the blocks, one at a time, in the lathe, then draws the lever towards him for an instant, and the work is done; the lever is pushed back and the spool drops down into a box below, while the right hand is ready with another block. These blocks are handled at the rate of twenty-five or thirty per minute. The 'finishers' also receive one cent-and-a-half per gross, and they can each turn out from one hundred to one hundred and thirty gross per day.

"The spools are thrown loosely into a large cylinder, which revolves slowly, so that the spools are polished by the constant rubbing upon each other for some time. On being taken out of the cylinder they are placed in a hopper with an opening at the bottom, through which they pass down a slide for inspection. Here the inspector sits and watches closely to see that no imperfect spools are allowed to pass, and a very small knot or scratch is sufficient to condemn them. The spools then pass into the hands of the packers, who handle them very lively. They are packed in very large boxes made the proper size, so that the layers of spools exactly fill the box and no additional packing is needed. These boys receive a quarter of a cent per gross for packing, and a smart boy, who is accustomed to the work, can pack about two hundred gross per day. One proprietor ships over two million spools per month to England, and another firm ships over one million spools to Glasgow, Scotland."

"The demand for timber for making spools," says *The Wood-Worker*,* "has never been taken into account as an important element in the lumber trade, but, as a matter of fact, it amounts to more than many suppose, says a lumber trade paper. This year, it is said, the sale for such stuff has been very large, and the Maine firms supplying it have driven a brisk trade. A large number of sailing vessels have cleared at Bangor for the river Clyde, carrying spool bars, and one steamer, which took 1,400,000 feet. A single concern at the point just mentioned, has sold 7,000,000 feet of this sort of stock during the past year. The trade is still active, and some difficulty is reported in securing the vessels to carry the lumber, in consequence of which the rates have considerably advanced. Maine and New Hampshire operators are said to have the monopoly of the business, one reason of which is, doubtless, that they have available an abundant supply of timber, within easy and cheap reach of salt water. The timber used is exclusively white birch, of which the spool-makers will take only the choicest and best the woods may furnish. The stock for this trade is sawed in squares of different dimensions and four feet long, and is delivered tied in bundles. It must be clear and free from all imperfections. The present center of the spool stock trade seems to be in Piscataquis county, Maine, but if it holds up to its present proportions there is reason to suppose it will extend into other parts of the State. There is an abundance of white birch growing in the Maine forests, and it is probably worth more for this purpose than any other for which it may be used."

CIGAR-BOXES.

A beautiful series of cigar-boxes manufactured and donated by Messrs. Samuel and Jacob Frost, of Cincinnati, was on exhibit in the

* *The Wood-Worker*, Dec., 1888, p. 17.

department. The series consisted of a varnished and an unvarnished specimen of:

Red Cedar.

Poplar, Red Cedar veneer.

Poplar embossed, Red Cedar imitation.

Plain Poplar.

Regarding the manufacture of cigar-boxes, The Chicago Timberman says:

"The log, if too long, is sawed off to a required length. Then it is hauled up an inclined plane to the mill. Here, by means of an endless band and veneer saws, it is sawed into one-quarter and three-sixteenths inch lumber. The cut timber is taken to the drying-room, where it is placed in racks, where the circulation of the air is free, and subjected to hot steam until the moisture of the wood is all dried out. The lumber is then taken out of the drying-room and planed. The seasoning and planing constitute the most important elements in a good cigar-box.

"The timber is now finished, trimmed, and the edges smoothed, and is sawed crosswise into the sides, bottoms and tops of the cigar-boxes. The selectors now take hold of the cedar, and pick out the best pieces for the front and the worst for the back of the boxes. The pieces are now ready to be put together, but they must first receive whatever printing and embossing the cigar manufacturer may require.

"A cigar-box originally needs four or five impressions. Besides the brand, which is stamped and printed on the top, there are legends, such as 'Conchas Specials,' 'Favorites,' and similar distinguishing words printed on the sides. The district internal revenue, number of the cigar factory using the box, and the quantity, is impressed, according to law, on the bottom of the box.

"The pieces are nailed into hooks first—that is, an end and a side piece are put together. The hooks are joined, and the box is ready for the top and the bottom. The latter is nailed on, and a muslin hinge is pasted on the former, which secures it to the box.

"From the nailing room, the boxes are taken to the pasting room. Here girls paste the edges, labels, etc., and the box is stood aside to dry. The box is now ready to receive cigars. Sometimes fancy touches, in the way of varnishing and putting on fancy paper are desired, but the ordinary cedar cigar-box receives the treatment I have described.

"When it is recollect that the cigar-box fulfills its mission the moment it receives its cigars, and must be destroyed, by law, as soon as it becomes empty, the number of boxes used in this country, with the progress of the cigar industry, and the law prescribing them as the only packing for cigars, it almost equals the number of hair-pins manufactured."

PAPER MADE FROM WOOD-PULP.

A panel with a few mounted samples of paper made from wood-pulp, directed attention to the use of wood for making paper. Comparatively few people are aware of the existence of such an industry. In Europe, and more especially in Germany,* the manufacture of paper from wood-

*Germany produces and exports, says Kuhlow's German Trade Review, more paper than any other country. Her superiority is best seen in wood-pulp paper and wood-pulp, the conditions being nowhere else so favorable. It is well known that cellulose prepared from wood is used as a substitute for rags in the manufacture of paper. The consumption of paper has become so great that the supply of rags would long ago have been unequal to covering the demand. Germany manipulates yearly, some sixty factories, about 600,000 cubic meters of wood (for which seven hectares of forests must be cleared.) All in all, the German cellulose manufacturers turn over 80,000,000 marks yearly.

pulp has assumed great dimension, while in this country we are just beginning to recognize its importance.

The species of trees mostly used in the manufacture of wood-paper are the Aspen, or Trembling-leaved poplar, (*Populus tremuloids*, L.) and the silver-leaved poplar (*populus alba*, L.) Wherever these wood-pulp paper factories are located, there is such a demand upon the wood of these trees, that it has become difficult to furnish the supply from the vicinity. Heretofore they had no real commercial value, except what they would bring for fuel, but now they command a price nearly equal to the more valuable trees.

Regarding the manufacture of this wood-pulp paper the Cincinnati Commercial* says:

"It surprises people to see the great logs of poplar wood go through the powerful machine at the Connecticut River Pulp-mill at Holyoke. The wood as it is brought to the mill, is about the size of cordwood used for fuel, and is this shape when the machine takes it and gnaws it up very fine. So rapidly does this process go on that the machine eats about seven and a half cords of wood a day, and this makes between *three and four tons of pulp*. After coming from the machine the wood is put into vats and reduced by the action of chemicals. It is used for the manufacture of news and book-paper, and pulp made from spruce wood is sometimes used in the cheaper grades of writing paper. Spruce is harder to reduce to pulp than poplar, and but little is used."

Another description of the process of making wood-pulp is given by the Chicago Tribune,† as follows:

"Any white soft wood may be used. The bark is taken off, and the knots, dark and decayed places cut out. It is then put in a large cauldron and boiled, which takes out all the glutinous matter and resin, and makes it soft. It is then put on a large stone-grinder, with water pouring on it all the time. This grindstone wears off the fibres until they are finer than saw-dust, which float away into a receptacle. The water is drained off by means of a fine sieve, leaving the pulp, which consists of a fine fuzz or splinters of wood. It is white and needs no bleaching, but is ready to be mixed with rag-pulp or anything else that has a strong fibre, and receive the proper constituents to make it into a paste, after which it is run off into paper sheets, whereas, rags have to be washed and bleached with chloride of lime, soda-ash and alum, and such strong chemicals to take out the color. Then they are picked to pieces and made into pulp. The process by which wood-pulp is made is purely mechanical, and as any soft wood, such as cottonwood and poplar, may be used, it can be made very cheap.

"All that is needed is plenty of soft clean water to wash the pulp, and power to drive the machinery. The cost of manufacturing this pulp is about a cent a pound. A considerable part of Western paper is made from straw, but Eastern paper consists of 75 to 90 per cent. of wood-pulp, the remainder being cotton rags, tow, or old rope."

The very interesting periodical *Forest Leaves*, published by the Pennsylvania State Forestry Association, quoting from a letter to the Washington Star, says about the manner in which wood-pulp is produced, as follows:

* March 20, 1880.

† March 17, 1880.

"The process of producing pulp is simple and interesting. Logs, chiefly of poplar and fir, about six feet in length and from twelve to eighteen inches in diameter, are floated from a reservoir above the mill to a self-feeding endless chain, which catches up and carries them to an upper floor, where they are received by a gang of hands, subjected to a circular saw, and cut in lengths of eighteen inches. Another gang then places them in a barking machine, which cleans the bark off thoroughly. They are then split into pieces about the size of large stove wood and then passed down to a lower floor, placed in boxes connected with hollow cylinders, revolving with wonderful velocity, and by a mechanical process, not visible to the eye, ground into impalpable wood, flour or dust. This falls into a tank of water beneath the cylinders, when it is pumped back to the upper floor and into shallow vats, where, after being strained and manipulated through a series of rollers, it passes out and is delivered in large sheets upon a broad inclined shelf, where an operator stands ready to receive it. The sheets are about one-eighth of an inch thick, and about as long and wide as a large-sized daily paper opened wide. This material, called pulp, is quite tough and of a creamy color. The operator, on receiving the sheet, folds it up a number of times. These folds are piled into bales and corded tightly, and are then ready for shipment."

SAW-DUST.

Twenty-four bottles of saw-dust, from as many different kinds of wood, each bottle being neatly labeled, directed attention to this common-place article.

"Very few people," says the *Manufacturer and Builder*,* "have ever estimated the value of the fuel which feeds the saw-mill furnaces in the form of saw-dust, which moves directly from the saw to the fiery gulf into which it is dropped by the automatic saw-dust feeders in the mills. Rating it at the price it would bring, provided it could be saved in the form of inch lumber, one would stand appalled at the figures. For every million feet of lumber piled on the docks coming from the circular saw, about 200,000 feet of the best portion of the timber passes into the 'fiery furnace' as fuel in the form of saw-dust. Or, to make it more comprehensible, in the year 1882, the mills on the Saginaw River cut over 1,000,000,000 feet of white pine lumber, which was the turning point in the output. During that year 200,000,000 feet of pine timber passed into the seething receptacles which produced steam, and was consumed for fuel. Suppose we estimate the cost—200,000,000 feet at \$14 per thousand, 'straight measure,' and we have the enormous sum of \$2,800,000! This looks like a pretty extensive fuel account for the mills on the Saginaw River; but that is what it would amount to in the form of lumber instead of saw-dust."

In some parts of the country saw-dust is gradually becoming quite an important article of commerce, and it is not at all improbable that the time is not far distant in which mill-men will be able to advantageously dispose of every pound of saw-dust. By a peculiar arrangement it is, in the East, put up in bales, measuring 24 x 28 x 36 inches, weighing about 325 pounds each, and shipped to the market. The demand is greatly in excess of the supply.

"The uses for saw-dust," says the *Wood-Worker*,† "are steadily multiplying, and it is in ever-increasing demand. It is used very extensively in packing goods for shipment. For stabling purposes it is used quite largely, being cheaper and cleaner than straw. Many

* *Manufacturer and Builder*, June, 1888, p. 121.

† *The Wood-Worker*, August, 1888, p. 18.

thousands of cords are used yearly in the manufacture of terra cotta. It also enters largely into the construction of apartment houses, for filling walls and floors to deaden sound. These are but few of the uses for which saw-dust is in demand."

One of the most important and perhaps the best paying uses of saw-dust is that lately inaugurated in Jacksonville, Florida, where a wood-distilling company has been incorporated with a capital of \$200,000, for the purpose of distilling or carbonizing dry saw-dust, obtaining wood-tar and crude acid. From the latter is obtained crude wood alcohol, from which, by a refining process, acid, turpentine, creosote, oil, etc., are obtained. One ton of saw-dust, it has been found, will produce 11.80 per cent. of merchantable produce. The plant erected by this company cost \$75,000, and will condense one hundred tons of saw-dust daily. One hundred men will be employed, and a large factory is being built.

OIL OF SASSAFRAS.

A rather peculiar object in this department, was a bottle of the oil of sassafras, standing alongside of a small bundle of sassafras root. There are various methods of distilling this product; the most primitive of all is probably the mode described in Popular Science News, which is as follows:

"In some of the interior counties of North Carolina, may be seen in operation many primitive establishments for the manufacture of the oil of sassafras and oil of pennyroyal. The apparatus used in this work is so exceedingly rude and primitive as to appear ridiculous to most observers; but the product is of good quality, and constitutes a profitable industry. For these oils, the usual style of 'still' may be briefly described as a short trench in the ground, ending in a low flue or chimney. Over this trench is placed a closed wooden box, having a sheet-iron bottom, and an auger-hole on top, through which water is poured. An ordinary barrel stands endwise on top of the steam-box, and has several holes bored through its bottom, and also through the top of the steam-box, allowing steam to pass freely up through the barrel. A lute of clay is used to close the joint between the lower end of the barrel and the steam-box, as well as the cover of the barrel. Instead of a 'worm,' a tin-pipe immersed in a trough of cold water is used; and a steam connection with the barrel is generally made by an elbow branch of wood, bored out with an auger. The sassafras tree (*Sassafras officinale*, L.) grows abundantly in this section, especially in worn-out lands, where it is usually found in dense thickets of small shrubs. The root is dug and washed free of dirt, and after being chopped short and bruised with a hatchet, is ready for the 'still.' This work is done by boys employed by the manufacturer, who pays a stated price per hundred pounds for the root ready for use.

"When the barrel is filled with the roots, and the lid made tight with clay, the process of distillation goes on rapidly. The steam passes through the mass of bruised roots, and is condensed by the tin tube into a mixture of distilled water and oil, and runs into a glass vessel, set to receive it. Being of different density, the oil and water rapidly settle into two stratas, and one can be decanted from the other.

"It is said that the operator of such a 'still' can pay all running expenses and make a clear profit of three dollars per day. When we consider that the cost of such a factory

is less than ten dollars for the entire plant, and no chemical education is necessary on the part of the operator, the profit of the work is not to be despised.

"The same outfit is used in the production of oil of pennyroyal, which grows abundantly in the woods in many counties."—[T. C. Harris.]

CREOSOTE.

A bottle with creosote oil and a piece of creosoted wood in one of the cases in the Ohio Forestry Department, were looked upon by a great many visitors as things out of place in a forestry exhibit, and yet creosote is an article of considerable importance to forestry, as will be seen from the following article on creosote, how it is made and for what used for, which appeared in the New York Mail and Express:

"Creosote is a general name applied to the products obtained from the destructive distillation of wood, coal and other carbonaceous fuels, after the temperature has risen above 200 or 300 degrees Fahrenheit. The oil thus obtained is termed creosote oil, and is an excellent preservative of wood. The philosophy of its antiseptic and preservative qualities is simple. The oil chokes up the pores of the wood, making it solid, and preventing the further entrance of air, moisture or life. No germinative life can exist in the wood thoroughly creosoted. The oil contains insoluble tar acids, not only antiseptic in their nature, but also possesses power of coagulating the albuminous or fermenting elements of green, sappy or unseasoned wood.

"Heavily resined, fatty pine wood, subjected to a heat of 300 to 760 degrees Fahrenheit, within closed iron cylinders, yields by distillation and condensation, an excellent wood creosote oil, suitable for the preservation of wood. When this oil is analyzed, it is found to contain about five per cent. of tar acids, about fifteen per cent. of the lighter oils, and at least eighty per cent. of the heavier oils insoluble in either fresh, brackish or salt water. Experience shows that preservation of timber is mainly due to those creosote oils which require more than 400 degrees Fahrenheit for their volatilization, and that the pure creosote, with less tar acids, and with less light oils, give the best results. Creosote oil is forced into wood by means of hydraulic pressure. The improvement made upon the old charring processes are very great. There is a carbonized process which takes ordinary, open-grained pine timber, and subjects it to a dry, radiant heat, within suitable cylindrical surfaces, in such a manner as to drive out of the timber most of its sap and albuminous matter, drying the inside of the timber, charring its outside, and leaving the wood with its pores wide open, and in condition to be completely filled with the oil. This process does not render the timber brittle. Sawed lumber only requires eight pounds of oil per cubic foot. In logs used for piling, twelve pounds of creosote oil per cubic foot is all that is necessary for its preservation. During the manufacture of creosote oil, a pyroligneous acid is condensed in this still. The acid, in its crude and undiluted state, is an excellent disinfectant. The progress made in creosoting timber within the past few years has been so great, it would be unsafe to predict to what extent it will be carried. Wood will be made more lasting than any building material."

CHARCOAL.

A model of a charcoal-meiler was made for the purpose of placing it in the exhibit, but for want of space it was excluded. The manufacture

of charcoal has been a powerful means of denuding many portions of our State of its forests. In reference to charcoal burning, the Lumber Trade Journal, quoting an exchange, says:*

"Charcoal-burning, once one of the great industries of the country, is now dead. It is good for the country and particularly for the State of New Jersey, where the business thrived. It was a ruinously wasteful industry. From the very start millions of dollars worth of salable products have been destroyed by the charcoal-burners, in order to obtain a product inferior to many of those that were sacrificed. The charcoal-burners have been the deadliest enemies of the timber supply of the Nation. Twice they have denuded the mountains of Northern New Jersey, and greatly thinned out the pineries of the southern part of the State."

Charcoal-burning began in New Jersey in 1730, when Cornelius Board started an iron forge at Little Falls, and it was greatly extended when Haencler came to this country in 1764, and started several forges and furnaces on his baronial possessions in Passaic county. It increased rapidly until coal came into use for iron smelting, and since then it has gradually decreased, so that the trees have a chance to grow again on the denuded hills. In recent years, nearly all the charcoal made has been consumed in the cities, and the consumption in dwellings has decreased constantly, while the factory consumption has not greatly increased. Charcoal is a great heat-producer, and is extensively used in jewelry shops and a few other factories, but it is not an economical fuel at any price. One of the most prominent lumbermen in the country, speaking of the waste caused by charcoal-burning, said the other day:

"Do you know how a rustic charcoal-burner burns coal? He levels a place and stacks up the wood on end until it makes a pointed stack about eight feet high and ten or twelve feet in diameter. This he covers with earth and sod until every bit of the wood is concealed. When the wood in this crude pile is fired, it must be carefully watched, night and day, until the conversion into charcoal is accomplished. Should it break into a flame there would be nothing left but ashes; so a man remains on hand at all times to keep the combustion from being too rapid, and to mend the mound as breaks appear in it. When it is all done the charcoal-burner gets a few bushels of charcoal for his labor.

"Let us see what he wastes. It is known that the manufacturer of creosote, acetic acid, wood alcohol, mordant and other chemical products of wood, can make a profit on each of these products, and have the charcoal free of cost. The wood is packed in a tight iron retort and a fire built under the retort. The temperature is raised to five hundred or six hundred degrees, and the liquid portions of the wood are converted into vapor, which passes through an iron or copper worm incased in a jacket of cold water. The vapor thus condenses into various products which are afterwards separated."

* Nov. 15, 1888, p. 9.

VI. SCHOOLS OF FORESTRY AND FOREST EDUCATION.

This department, though small, was one of usual interest to all friends of forestal education, because it was the first exhibit of the kind ever attempted on this continent.

Some of the objects shown in this division, which occupied two large show-cases, were especially prepared for this Exposition, while others were collected with other objects of interest to forestry, and represented the labors of many years.

The most prominent exhibit was that of *The Moravia-Silesia School of Forestry at Eulenberg, Moravia, Austria*. It was obtained through the courtesy of *Forest-Master Herrn Augustin Buchmayer, present director of that Institution*, and consisted principally of the following objects:

1. Two photographic views of the Castle Eulenberg, at Eulenberg, in Moravia, wherein the school is located.
2. Photographic likeness of—
 - (a) All the directors of the institution, from its first organization in 1852, to the present day.
 - (b) The present faculty.
 - (c) A student of the school—
 - (a) In winter uniform,
 - (b) In summer uniform.
3. Lithographic maps of the school-forests at Eulenberg.
4. Graphic charts showing the administration of the school forests.
5. An elaborate table showing the annual revenue obtained from the school-forests, from the beginning to the present day. This very interesting and instructive table was prepared by Forest-Master Herrn Augustin Buchmayer.
6. Seven drawings of the plans of the seven forest-tree nurseries (Baumschulen) of the school.
7. A pamphlet giving the complete history of the institution, by Herrn F. Krætzl.
8. A pamphlet entitled *Die Neue Pflanz-Methode in Walde*. (The new method of planting) (illustrated), by Herrn, Forest-master, Morita Kozesnik, a graduate of this Forest-School.

For the above exhibit the Exposition Commissioners awarded the certificate of merit. The objects in this exhibit were presented by the school to Adolph Leue.

Besides this there was an exhibit by A. L. of—

1. Lithographic views of the Forest Academy at Eberswalde, in Prussia.
2. Time-table and course of study of the Forest Academy at Munden, Prussia.
3. A pamphlet from the Forest-School at Evois, Finland, by the Director of that Institution, Herrn Aug. Blomquist.

4. A complete set of forestry Bulletins, issued by the Census Bureau at Washington, D. C. of 1880.
5. Maps of the Census Report of the U. S. of 1880, showing the forestal relation of the United States.
6. A library of works on Forestry for reference.
7. Drawing instruments, etc.
8. Maps and plans illustrating forest-management in Prussia.

MISCELLANEOUS OBJECTS.

In this division were shown objects which could not well be classified in any of the foregoing divisions. Among them was:

1. An Apple-tree section, presented to A. Leue by Major Jas. R. Hall, of Marietta, O., it bore the following label:

"1797.

1888.

"91.

"Section from the limb of a Rhode Island Greening Apple-tree, planted in Adams township, Washington county, O., by William Mason, one of the 48. The tree is 12 ft. 2 $\frac{1}{2}$ inches in circumference, 15 inches from the ground, and had three branches, which measured as follows:

" No. 1.....	6 feet 2 inches.
" No. 2.....	5 feet 9 inches.
" No. 3.....	5 feet 3 inches.
" Total.....	17 feet 2 inches.

"The limb from which this piece was taken was cut off by the Z. & O. R. R. Co., about 12 feet from the ground. The tree still bears fruit."

2. A Wild Cherry-tree section, from Dr. J. E. Douglass, of Cincinnati, O., bearing the following inscription:

"EAST WALNUT HILLS, GRANDIN ROAD.

"Section of sliver of Wild Cherry, thrown 372 feet from base of tree, by a bolt of lightning, March 20, 1888. Length of sliver, 5 feet 4 inches; weight, 30 pounds."

In reference to this section of sliver, Dr. Douglass sent the following letter, which will be found of interest:

GRANDIN ROAD, CINCINNATI, O., April 16, 1888.

MY DEAR FRIEND: Perhaps you may recall the thunder-storm that passed over Cincinnati and suburbs on the night of March 20. The storm was especially remarked for the heavy thunder occurring so early in the season. The day previous had been one of rare beauty, and strangely out of place in that blustering month. A brisk but pleasant wind had been blowing all morning from due south, and, borne upon the breeze, was the

plainly perceptible odor of the lilac. In fact, the fragrance was so intense, that, involuntarily, I turned in the direction of the lilac bush, though I knew it to be about a month too early for the blossom. Unwilling to trust to my sense alone, I called my sister Mary to the door and inquired of her, whether she could detect a perfume in the breeze; she paused only for a moment, and my doubts were removed, when, with a little start of surprise, she exclaimed, "lilac!"

The morning of the 20th was equally delightful, but the wind had veered to the east, and there was a haziness of the atmosphere that reminded one of Indian Summer. Toward evening, however, camulus clouds appeared in the southern and eastern skies, and continued to spread over the heavens in loosely scattered fragrants. About nine o'clock the distant rumbling of the thunder could be heard, and an occasional lightning flash would gleam in the east; a gentle rain began to fall, and there was nothing in the aspect of the heavens to indicate the electrical display that followed. The lightning was of a deep bluish tint, and, as it darted across the sky, there was a deafening detonation, and the concussion shook houses to their very foundation; it was like the springing of a mine, or the jar of heavy artillery. Shortly after nine o'clock there was a terrific explosion. I had descended to the cellar to close a window, and was in the act of fastening the latch, when the whole interior was so brilliantly lighted; and almost simultaneously with the flash, came the heavy thunder that shivered a window-pane in the sitting-room, and sent the shattered fragments jingling to the floor.

I felt sure that the bolt had followed the rod on the house, and feared that the shock had been felt by those in the rooms above, and it was with the deepest suspense that I hastened to retrace my steps. I was gratified, you may be sure, to find them all speculating upon the object that had been struck. Shortly after, there was a light fall, and in half an hour, only the muttering thunder of the departing storm could be heard.

The dawn of the following day revealed the object upon which the lightning had spent its force. There stood, about three hundred feet from the house, a graceful and beautiful wild cherry-tree of seventy or eighty feet in height. The diameter, I would suppose, measured two feet or over. Twenty feet or so from the ground, was a bifurcation of the trunk and the dividing limbs were of about equal size and length. With but little effort on part of the imagination, such a tree may be pictured, but such a havoc as was wrought by that lightning stroke must be seen to be understood, for it beggars description. Both limbs, just above the crotch, were stricken off after the fashion that one would cut a weed in two with his walking-stick. The limbs, with their shattered stumps, were plunged into the ground, only to fall athwart the spot where the body of the tree once stood, while the entire trunk was riven into splinters. The scattered fragments were hurled over a distance of three hundred feet, and described an immense arc on the eastern and western sides. The slivers were of all sizes, from that of the smallest splinter, to the fence-rail; and some of the longest stood in a perpendicular position, having been driven a foot or more into the ground, at a distance of over two hundred feet from where the tree stood. The largest piece was some ten feet long, and seemed to be about the quarter part of the trunk. Attached to this piece was an enormous root two or three feet long. The gigantic force that could tear off such a piece and throw it to a distance of one hundred feet, can be imagined only. The space between the two extreme fragments on the east and west of the tree, was from five to six hundred feet. The piece of which you have a section, I picked up 372 feet from where it grew.* The original sliver measured five feet four inches, and weighed thirty-two pounds.

Of the many that viewed the tree, not one had ever seen the like, and as they wandered among the splintered and twisted fragments, there were frequent exclamations of mingled awe and surprise, and a firm belief that Old Nick himself was at the bottom of it all. I related the circumstances to our mutual friend, Dr. D. S. Young, and was pleased to find, at least one who had seen a single instance of the like. Said he, "In my old home,

* This is the piece that was on exhibit.

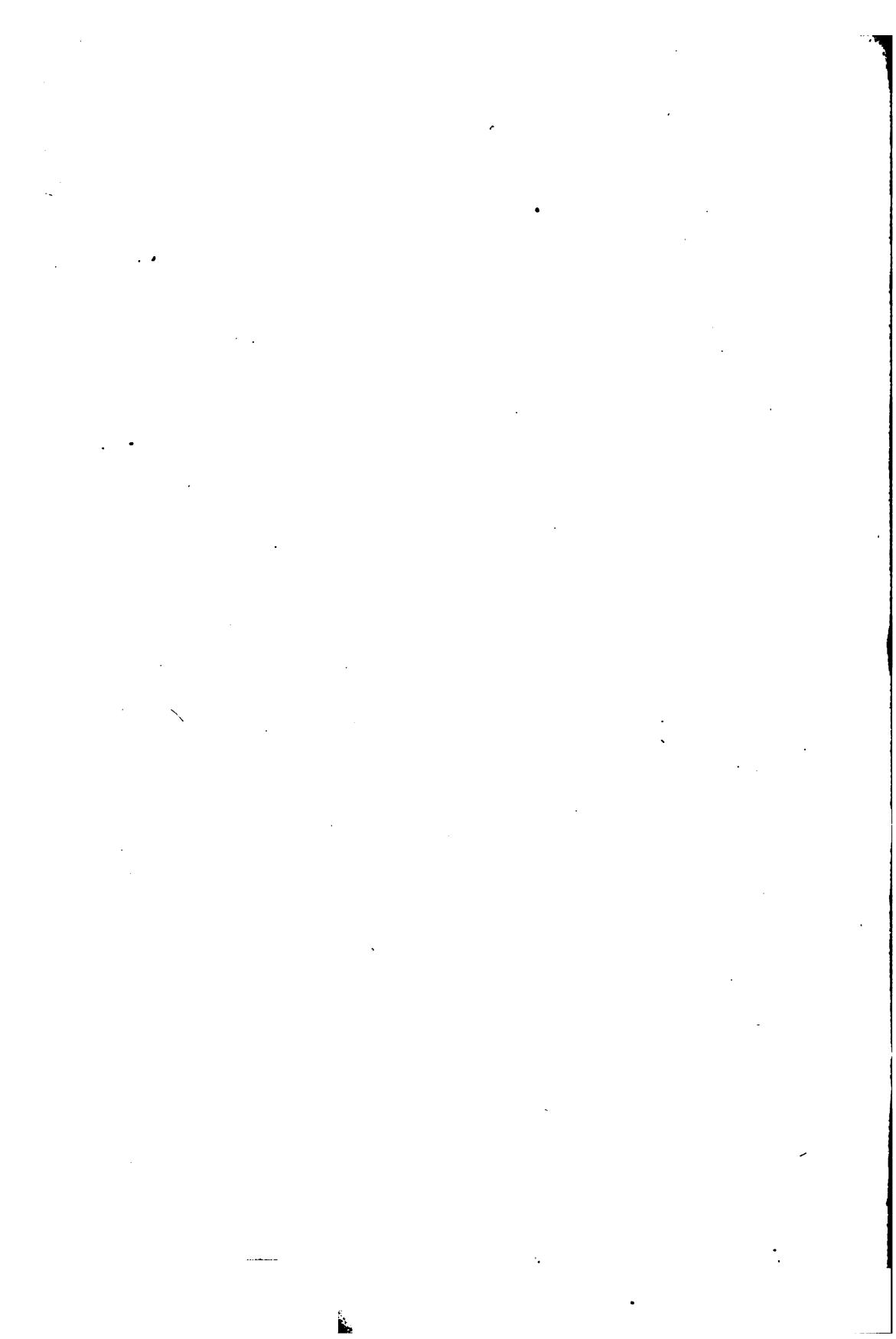
in the State of New York, I once saw a hemlock of about the same height as the tree of which you speak, splintered much after the same fashion. It stood on the edge of a marsh, and, though I was but a boy, I distinctly recollect seeing the white splinters sticking in the soft ground, at a distance of three hundred feet. Of the trees I have seen struck by lightning, I have noticed that the tapering part of the tops were but little injured; but where the trunks begin to assume a uniform size, the tearing and splitting commence. Through the Carolinas and Georgia, in Sherman's march to the Sea, it was frequently remarked by the 'boys,' that the trees standing in the valleys and low lands were more often struck by lightning than those on the hills and high grounds."

The tree of which I speak, stood upon high level land. I had no intention of imposing a letter of this length upon you, but as it touched upon trees and ground, it was like the immortal Topsy, it "just grew."

Yours truly,

JOHN E. DOUGLASS, JR.

MR. ADOLPH LEUE,
Secretary State Forestry Association.



PART II.

ON TREES AND TREE-PLANTING.

- I. Forests and Forest-Trees and their Preservation.
- II. Forestry and its Needs.
- III. Four Points regarding Forestry.
- IV. Timber Culture.
- V. Among the Trees.
- VI. The Coniferae.
- VII. Digging and Planting Evergreens and their after care.
- VIII. Transplanting of Evergreens.
- IX. Evergreens: Transplanting in Theory and Practice.
- X. Evergreens for Protection from Winds and Blizzards.
- XI. Ornamental Tree-Planting.
- XII. Road-side Trees.
- XIII. Road-side Tree-Planting.
- XIV. Culture of Forest-Trees.
- XV. Twelve Tree-Planting Pointers.
- XVI. Embellishment of Lawns.
- XVII. The Yew Tree.
- XVIII. Life in a Lumber Camp.
- XIX. The Spirit Council.

FORESTS AND FOREST-TREES AND THEIR PRESERVATION.

It is a strange fact that most people consider the forestry movement in this country to be of a very recent origin, because the scattered notices of the early efforts in behalf of forestry escaped their notice, and only few take time and trouble to examine the earlier rural publications. These errors of course will be corrected by those who will undertake to write the history of forestry in America. In the meantime it will be well for us to occasionally look back upon those earlier efforts, which are often very instructive.

Thus we find in the *Horticulturist*, June, 1865, a very interesting article on the *Preservation of Forests*, by C. N. B., of Poughkeepsie, N. Y., which is well worth the consideration of the friends of forestry. The writer says:

We feel proud of the natural features of our country—our rivers, our hills and mountains are varied and grand in range and height; our fossil and mineral resources inexhaustible, and intrinsically of the most valuable kinds; our soil productive of the comforts and most useful of sylvan productions. These natural features correspond with the extent of our territorial lands and the nobleness and excellence of our civil institutions. The hills, and the mountains, and the rivers are in the keeping of the Creator, having received the immutable stamp of nature; but the preservation of our forests, like that of our liberty, is obligatory on ourselves. By a provident care both will live for ages. The venerable grey-headed patriots among us, who appear to be intuitively prescient, point tremblingly and fearfully to the daring and reckless woodman and politician, so sacrilegiously approaching the forests and the constitution of the land.

Placing in such equal importance our liberty and our forests, may seem to some to be overrating the one and underrating the other; but when it is recollected that we, as expressed by a Roman naturalist, "by the tree we navigate the ocean, cultivate the earth and build our houses, it should not be considered an unpatriotic Union." What would have been our commercial importance and our naval standing among the Nations of the earth, had it not been for our forests? Let any one reflect for a few moments on the immeasurable uses to which the tree is devoted, and consider how intimately connected are our comforts and pleasures with its great value and primary importance of our forests, he will see that the least scarcity or advance in price very materially affects every branch of trade and every department of domestic pursuits.

It must be a subject of astonishment to observe the wonderful intermixture and seemingly inseparable connection between both moral and physical good and evil; to see that the same thing which we at one time dread with abhorrence, at another time, and perhaps under different circumstances, becomes a subject of pleasing admiration. We often hear

heartrending tales of the gloomy forests, in the compass of nature's works surpassing those of the forests.

The emigrant to an unsettled country looks upon trees as so many savage enemies, which he must conquer and exterminate before he can hope for enjoyment of peace and tranquility. When other emigrants settle around him, and they begin to direct their united efforts towards arriving at a state of civilization, they see nothing in their mind's eye but cultivated fields, with meadows and pastures, with all the stumps eradicated, and not a single cluster of trees to interrupt the view. If a single patch is left for fire-wood, it is often sneered at, as it is cheaper to buy wood than to devote the ground to its incumbrance.

But the population increases, perhaps becomes a village or city. The demand for fire-wood increases, and timber is wanted in all the various departments of ship and house building, carriages and other branches of manufacture, and every patch of forest vanished before the footstep of cultivation like patches of snow before the vernal sunshine, until, as is the case in some parts of this country, every piece of timber has to be brought from a great distance, if not even imported from a foreign country, and coal dug from the earth for fuel.

In this state of things, sober reflection, which, though slow, is often a correct teacher, shows us by costly lessons what it would have thought before had it been consulted, that if, instead of wastefully destroying and exterminating the forest-trees, they had been used with prudent economy when necessary, and skillfully managed and preserved, they might have contributed largely to pleasure and to profit.

But when the folly has been committed and its consequences are beginning to be sensibly felt, what remedy can be applied, if not to afford immediate relief, at least to prevent posterity from suffering by its effects? The still small voice of common sense, confirmed by the examples of several nations of Europe, points to the remedy. The first step is to apply to some well-established nursery where all the most valuable trees could be obtained at moderate prices; a few would avail themselves of their advantages, and the force of example would soon excite the multitude to follow them, and in a few years those who live to see our dwellings, which now stand as unornamental as mile-stones, tastefully surrounded by beautiful trees, and their value doubled in the eye of most purchasers; they would see our public roads lined with extensive rows of valuable trees, and last, though not least, our farm-houses would be sheltered in their situations from bleak and destructive winds by belts of pine and fir trees, and their cattle and sheep would find protection from the blasts of winter, and places of repose from the sultry summer heat.

The uses of forest-trees to which we refer, are for shade, for timber, and for fuel. A tree forms part of almost every instrument and every machine by which the genius of man has taught him to lighten the labor of his hand.

Of shade trees, both for timber and ornament, we have indigenous, a greater variety than any other nation.

Every man of landed property that lies out of arm's length of a village or town, should plant trees. Even an old bachelor, who has no right to become a father, is not only free, but is in duty bound to plant a tree.

People are sometimes prevented from planting trees from the slowness of their growth. What a great mistake that is! a strange fear to feel, a strange complaint to utter, that any one thing animate or inanimate, is of too slow growth, for the nearer to its perfection, the nearer to its decay. Let any one who accuses trees of laziness in growing, only keep out of sight of them for a few years, and then returning home to them under a cloud of night, all at once open his eyes on a fine, sunny summer's morning, and ask them how they have been since he and they mutually murmured farewell. He will not recognize the face on the figure of a single tree. That single maple, whose top-shoot you know, broused off, to the breaking of your heart, some four or five years ago, is now as high as the gable of the cottage, and is murmuring with bees among its blossoms, quite like an old tree. What precocity! That elm, hide-bound as it seemed to you, and with only one arm that it could

hardly lift from its side, is now a Briarius. Is that the larch you used to hop on? now almost fit to be a mast of one of the cutters or yachts of the Hudson! You thought you would never have forgotten the triangle of the three beeches, but you stare at them now as if they had dropped from the clouds; and that birch—that round hill of leaves—is not the same shabby shrub you left sticking in the gravel. Why, call the old gardener hither, and swear him to its identity on the Bible.

FORESTRY AND ITS NEEDS.

A writer in the *American Rural Home*, who signs himself "Arnal," speaking of his *sad experience in tree-planting*, says:

"I see a great deal lately about planting black walnuts, etc. Well, I have planted black walnuts, chestnuts, horse-chestnuts, hickory nuts, peaches, plums, cherries, and all the rest, and not one single, solitary tree have I to console myself with; so now, what encouragement have I to plant 'ten acres' of my 'waste-places' and make my 'fortune in ten years'? I am sorely afraid it would be made right down hill! Also, all these same papers say, 'Plant trees, my friend; plant trees, grape-vines, strawberries, etc. They are as easy to grow as potatoes, and are more profitable; and then sit under your own vine and fig-tree and see how good the fruit tastes.' Well, if I live to taste fruit of my own raising, I fear I will be as old as Methuselah! For over three years I have planted early and planted late; from the time the frost was out of the ground in the spring until snow fell in the fall. I have dug and manured and mulched and watered, until I am weary of my life, and 'nary' fruit. I have spent \$100, or more, for trees and bushes. I set out twenty grape-vines three years ago, and fussed and tended them as if they had been babies, expecting this year to have fruit. I have just three tiny vines left, and they are dying! I have set out trees hard and trees soft, trees large and trees small, big bushes and little bushes. The gooseberries and currants drop off while they are green; the strawberries and raspberries dry into little stones before they ripen; the trees winter-kill in the winter and summer-kill in the summer, and what are left the bugs, and the borers, and the spiders and the flies and the caterpillars and the grubs devour, and I have not twenty-five cents' worth of stuff left. It's all a delusion and a snare. I have risen early and worked late, and used Paris-green and hellebore and carbolic acid and kerosene and soap-suds, all in vain; the bugs and worms flourish and grow fat until the trees are dead, when they, too, take their departure.

"Now, when the papers tell us such wise things to do, I, for one, want them to tell just how to do it, for I don't know. I am still willing and anxious to learn in spite of my experience, for I, too, want to have some trees, and I want still more to have some fruit. So I hope some one will tell me how. There are elms and oaks and maples here by the house seventy feet high, and great butternuts; and we have plenty of potatoes, and don't mulch or water them either. So what is the trouble?"

FOUR POINTS REGARDING FORESTRY.

BY B. E. FERNOW, CHIEF OF THE FORESTRY DIVISION, DEPARTMENT OF AGRICULTURE,
WASHINGTON, D. C.

1. *What is Forestry?* It is the same thing as Agriculture—a business. The difference is only in the kind of crop and in the manner of treating the crop. It is the production of the wood-crop we are after. This is the crop which grows, or can be made to grow on those parts of the farm which are useless for all other crops. It is a slow-growing crop, to be sure, but it grows while you are asleep, and you put it into the ground but once, where it will thrive without further care for many years; and if properly started, it needs no hoeing, no cultivating, no worrying about the weather. And when you come to reap it, it will prove to yield a profit from ground that would otherwise have been left not only unproductive, but unsightly in addition.

If only for the looks of it, a piece of young timber, thriflily growing, enhances the value of the farm. Therefore plant the unsightly waste places to trees, remove those ugly spots from your farm which spoil its good looks. It costs but little more than an occasional day of enjoyable work.

Don't figure on the profits of the sticks that you are going to cut; there is profit indirectly on your surroundings accruing from such planting, which defies all strict financial calculation, besides your own satisfaction, which will surely reflect from such work beyond any direct money gain, though this will not be lacking either, in proper time. It has been proved over and over again that a good wood-lot will sell the farm—if sold it must be—at a better price than it would have brought without it.

And you who are the happy owner of a wood-lot treat it as the goose that lays the golden eggs; the eggs will soon be high in price, the goose is worth caring for! If you cut, do not cut the good trees only and leave the bad ones to spoil the looks of the lot and to injure the young growth, that would be better off, if the gnarly old fellow overhead did not stand it its way with shade and drip. Always give some light and room to the young folks!

Forestry means more than tree-planting; it is the art of managing a wood-crop so that it will reproduce itself spontaneously by the seed from the old trees and afterwards helping the young growth to make the best

timber in the shortest time. Nature will reproduce and grow timber, without care, if allowed by man, but she takes time, and time is money—at least to a careful man and manager.

Then use your odd moments in improving your crop; the axe, too, is a cultivator, in judicious hands.

2. *What interest has the farmer in Forestry?* More than he knows. The wood-lot is to a farm what the work-basket is to a good housewife, with which she improves the odds and ends of time that the main business of the day allows, especially in winter time.

Now it is possible that you can get for the timber, which your grandfather has left you untouched, \$50 or \$100 per acre from a hungry saw-mill man. Down come at once the old trees, that it has taken one hundred and more years to grow; and, in nine cases out of ten, what is left? A useless piece of ground, which reduces considerably the value of the fields lying near. Had you considered this wood-lot as a savings-bank from which you could draw in interest every year what you need, taking care that the young growth is properly protected against cattle and fire, and against damages from inferior kind of trees, you would have a better kind of investment than the loose dollars which resulted from the sale.

May be your wood-lot was on a hill-side from where the spring that waters your cattle, gets its water, or where the brook that runs your mill-stones rises. And, lo! the spring runs dry half the year and the brook, too, or else it breaks out in spring freshets, and the dollars which you got from the forest above, you have to spend on repair of damages below.

There is no imagination in this; these are occurrences everywhere, and experience is growing in this country which shows that the forest is a useful regulator of the water-supply: the water reservoir of the farm.

The farmers must have more interest in keeping a proper proportion of the country under forest cover than any other class of citizens, for they depend in their business greatly upon a proper water supply, and for this the forest does admirable service.

You are, or ought to be husbandmen, not only of the soil, but of the water capital of the world also. Do you realize that each acre of your fields requires from one to two million gallons of water to do its duty in growing crops during the season?

3. *Water and Forestry.* The amount of water in the world does not change; it will probably always remain the same, but its distribution is changeable, and may be changed by the operations of man. There is one part of the water capital of the world, which is in constant circulation. Now we see it suspended as clouds in the air, now it pours down upon the earth, partly to run off over the ground into brooks and rivers to the sea,

partly to sink deep into the ground, and run in under-ground channels to places, where it appears as springs, and another part remains in the ground for awhile, to be evaporated under the influence of the sun, and by the action of plants (pumping it up and transpiring it) and thus to be returned into the air. There it combines again with the water evaporated from the sea, the lakes and the rivers, to form again clouds, and to again pour down as rain and go through the same course.

Now, the skill of the farmer is to utilize this water capital for his crops to its utmost, as long as he can control the flighty element. It is for this mainly that he plows the ground and cultivates it—weeds or no weeds—for the plowed ground absorbs more and evaporates less water. Yet, in many places there are seasons when he cannot, with all his work, manage to keep the water supply in a satisfactory state, and a water-reservoir, from which he might supply deficiencies, would be most welcome.

The forest with its spongy huminus cover, and its tendency to condense the moisture of the atmosphere, and to induce it to fall as rain, the forest, which prevents by its shade, the rapid evaporation of the water in the soil, and the rapid melting of the snow, is the most inexpensive water reservoir for the farmer. It feeds the springs and brooks, and by gradual filtration through the soil, keeps the ground-water-level high enough to be useful in supplying the upper soil strata and the crops with moisture.

Therefore, keep a part of your farm under constant and dense forest shade, use the trees, but see to it that a dense new growth will shade the ground immediately. Thus you will avoid droughts and freshets, and you will utilize the water capital where it is within your reach, instead of wasting it in floods.

4. *Is Forestry Profitable?* This question may be answered in the same way as the question, "Is agriculture profitable?" To some it is, to others it is not. It depends entirely on circumstances and local conditions, and on the manner in which you carry on business. On the plains and prairies, people who have tried to make forestry pay, are well satisfied with the results. Not only have they gained in comfort and in benefit to their fields, but the actual material return on their expenditure for forest-planting, begins to satisfy them that "it pays."

To show you that forest property and forestry is likely soon to be more profitable in every part of the country, let me give you some points for calculation:

The entire surface of this great country contains at present less than half a billion of acres of woodland, out of nearly two billions of acres of surface. If this were all good timber, there would grow upon it from fifty to sixty cubic feet of wood per acre every year, but, you know, there is a great deal of waste brush-land and worthless, thinly-stocked growth, so

that we cannot count on more than perhaps ten billion cubic feet yearly growth on the entire area. Now, how much do we use each year? There are 175,000,000 cords alone burned up in our stoves, in spite of all the coal that is used besides. We use every year for repairs and new fences enough posts and rails to make a fence containing forty cubic feet of wood to the rod, along the entire land frontier of the United States; the railroads need yearly as much ties and timber as will build 200,000 good sized barns, and lumber cut yearly will cover the whole field area of Connecticut with a tight half-inch floor, or if made into one quarter-inch stuff would cover out of sight the entire State. Altogether we use up annually over twenty billion feet of all kinds, or probably double as much as there grows yearly in the whole country, and our population is increasing in an accelerated ratio with our needs. What must be the consequences?

Reduced supply, increased demand, and higher prices. It takes many years to grow a tree of size. The man who plants now will have a tree worth cutting in the time of high prices.

Therefore, if you have a wood-lot, hold on to it and work carefully; if you have a waste corner, plant it to trees; it will surely be profitable.

TIMBER CULTURE.

Essay read before the Franklin County Horticultural Society, at the June meeting, by
W. E. KIBBIE.

With our fathers and grandfathers the great problem which presented itself for a solution was how to get rid of the great oaks, beeches, maples, hemlocks, and the primeval forests which surrounded them, in the shortest time and in the easiest manner. This mighty crop of timber which nature had been centuries in raising, had to be harvested with almost infinite toil and patience before the husbandman could sow his seed or the horticulturist plant his trees or flowers. Few of the present generation know anything but the merest A, B, C of labor, so severe, so continuous, so back-aching, as did our ancestors in their awful struggles with the boundless forests. Muscle was king in those days, and the man who could fell the most trees, cut the most wood, split the most rails, and roll the largest log, was crowned the greatest hero. Our conditions and surroundings are almost an exact reversal of theirs.

The first step towards civilization was to cut down a tree; ours is to set one out. Their mission was to create green fields, smiling farms and

contented homes out of the forests; and to-day great commonwealths and busy cities attest the success of their mission. Our mission is to change these great boundless plains of the West, where the buffalo, antelope and Indian have roamed since the morning stars first sang together, into farms and homes, with trees, groves, and orchards dotting the landscape with views of beauty and loveliness.

In responding, Mr. President, to the duty assigned me of preparing a paper on forestry and its artificial growth for domestic use, I will assume it as a settled question that trees *will grow*. This evidence is furnished on every hand and cannot be disputed, and the only things to be considered are what kinds to plant, and will it pay to plant them. In considering the kinds to plant, much information will be gained by noting that on our farms we have three great and ever present uses for timber, first, as fuel; second, stakes and poles; third, for fence-posts. The first can be bought largely in the form of coal, if one prefers and has the money to buy with, and money will purchase the last; but the second cannot well be bought, as a pine scantling is a very poor substitute for a pole.

The idea extensively prevails that a man who plants a forest-tree plants for a future generation, but it is a grave mistake, a gross error in all its parts. Twenty years ago at this time I was engaged in building my house, and prairie was all around me, with neither tree nor shrub, and every tree you see on my farm has grown since the beginning of 1870. I assume it as a part of a farmer's business to raise everything he can with profit, whether it be a post, a patch of flax, or fuel. Ninety-nine farmers out of every one hundred have more acres than money, and also more time than money. Now, if by putting this surplus time and acres together, he can raise his fuel and save the twenty or thirty dollars spent annually for coal, I assume it as wisdom to do so, and if he can raise his posts on the farm, which he now has to buy by the hundred and thousand, and thus save the ten or fifteen cents which each one costs, is it not good business sense to do so? It is the little leaks that sink the greatest ships. It is the constant dropping, ever of water, that wears away the hardest granite; so it is the continued buying that eats up a farmer's substance and puts him in the hands of the usurer and face to face with the sheriff. If there is a man on earth who ought to be independent, and walk upright with high head, it is the farmer and horticulturist; but it is not so. The complaint of hard times, scarcity of money, of syndicates and trusts, are well-nigh universal among them.

I will relate some of my personal experience in practical timber culture. I am utterly unconcerned about coal, or coal trusts, as I have for some four years or more burned only my trimmings and thinnings for fuel, and I have now at least a year's supply of fuel ahead. In fact, I

don't consume all my surplus wood. If I want to use a stake or pole of any size, I have them in abundance, from a fishing-pole to a barn-girt. If I want a post, I have a plentiful supply grown and growing, of the very best kind, sufficient for my use for an indefinite time to come. I have a barn building, covering nearly 3,000 square feet, with hardly a pine stick in the frame, and most of it of my own grown timber, planted since 1870. I saved not far from \$150 in the barn frame by using home-grown timber, and can laugh at lumber syndicates and railroad magnates, to that extent, at least, and I now have a building to keep my hay, grain, stock and tools from the destructive influence of our Kansas climate.

There is another important credit to be given to trees on the utility side, and that consists in the shade and cooling place for stock during the heat of summer, and protection from the winds and storms of winter. But there is another side, the value of which is difficult to measure, but no less real—the comfort and pleasure of shady grounds—and gold would not tempt me to cut down my trees. With all the various centripetal forces that line the pathway of the Kansas farmer, such as drouths; winds, hot and cold; bugs of many kinds, and infinite in number; grasshoppers, etc., etc., all bid to make him and his family dislike, yes, hate farm and farm life. The strongest centrifugal force with me, stronger than all others combined, is my trees, planted and cared for by my own hand. I turn to them with genuine affection. I love my trees, and were it not for them, would doubtless have quit farming years ago!

I would not advise planting on a large scale; there would be no money in it for the average farmer; but every prairie farm could well afford to have from five to ten acres growing in timber, and it would pay more than any such ground in field crops. With the uncertainties of farming, the cash rental of good corn land, such as would be required for a grove, would not be over \$2 per acre, annually, and it would be a poor grove of five acres that would not pay \$25 each year in supplying farm needs, without taking into account the great enhancement of the value of the farm.

There are several valuable kinds of native timber that do well on the prairie, and grow rapidly and readily. Walnut grows easily, but in general slowly, and it will take fifty years to become a walnut tree. Yet some return can be had from the nuts it bears. Honey-locust is a fine growing tree, and makes excellent fuel and tough springy poles. Cotton-wood is rapid in growth, makes good girts, can be planted closely, and in twenty to twenty-five years will make good saw timber for inside rough work. White oak is very easily grown, is a beautiful tree, good for everything, and a middling rapid grower. Elm, both white and red, are beautiful trees; none better for shade, and are good for fuel. For an all-pur-

pose tree, the Ossage orange is by far the most valuable. It can be grown as a hedge, but as such I abhor it; as a tree, I cheerfully give it the crown. It is a rapid grower, beautiful in form and foliage, better than hickory; for fence posts, as durable as the best of cedar, and it has the very rare peculiarity of its heart-wood being as durable in young growth as in the older tree. Its thorns never come but once, and soon grow over, and it is then smooth and invaluable for posts, and its heart-wood seems as firm and hard when green as when fully seasoned. I have turned the edge of the best ax in cutting even the green timber.

While nearly every one admires trees, and may admit their utility, you see but very few groves being planted on newly-improved farms. I think at least nine-tenths of the first trees of Franklin county were set out between the years 1865 and 1875. Ottawa, to her honor and praise, continues in the good work of planting trees, as her borders enlarge, but the lesser towns in the county are sadly deficient in this work. It would indeed be difficult to define the cause of this neglect, not only of the beautiful, but of the useful. On this side of the tree growing, may be mentioned the home they afford for the birds, these feathered friends of ours, God's most joyous and musical creation. How many times have I listened to their wondrous melodies. I have paid fifty cents to hear Gilmore's crashes of music, and felt well repaid, but I have heard a thousand times rhyme, melody and song by the birds, which far transcended any of his musical melodies, free of cost. Thanks to my trees. I am a friend to the birds. I never shoot, or permit any one else to shoot them, and, as a consequence, they nest in large numbers among my trees, and do me little harm compared with the good I receive.—[Kansas Farmer, July, 1888.]

AMONG THE TREES.

Among the studies of trees we cannot fail to be impressed with their importance, not only in the beauty of landscape, but also in the economy of life; and we are convinced that in no other point of the vegetable creation has nature done so much to provide at once for the comfort, the sustenance and the protection of her creatures. They afford the wild animals their shelter and their abode, and yield them the greater part of their subsistence. They are, indeed, so evidently indispensable to the wants of man and brute, that it would be idle to enlarge upon the subject, except in those details which are apt to be enveloped.

In a state of nature man makes direct use of their branches for covering his tent, and he thatches it with their leaves. In their recesses he hunts the animals whose flesh and fur supply him with food and clothing, and from their wood he obtains the implements for capturing and subduing them. Man's earliest farinaceous food was likewise the product of trees; for in his nomadic condition he makes his bread from the acorn and the chestnut; he must become a tiller of the soil before he can obtain the products of the cereal herbs. The groves were, likewise, the earliest temples for his worship, and their fruits his first offerings upon the divine altar.

As man advances nearer to civilization trees afford him the additional advantage which is derived from their timber. The first houses were constructed of wood, which enables him, by its superior plastic nature, compared with stone, to progress more rapidly in his idea of architecture. Wood facilitates his endeavor to instruct himself in art, by its adaptedness to a greater variety of purposes than any other substance. It is, therefore, one of the principal instruments of civilization which man has derived from the material world. Though the most remarkable works of the architect are constructed of stone, it was wood that afforded man that early practice and experience which initiated him into the laws of mechanics and the principles of art, and carried him along gradually to perfection.

It is in these relations, leaving their uses in economy and the arts untouched, that we would now speak of trees. We would consider them as they would appear to the poet and the painter as they are connected with scenery, and with the romance and mythology of nature, and as serving the purposes of religion and virtue, of freedom and happiness, of poetry and science, as well as those of more taste and economy. We are persuaded that trees are closely connected with the fate of nations, that they are the props of industry and civilization, and that in all countries from which the forests have disappeared the people have shrunk into indolence and servitude.

Though we may not be close observers of nature, we cannot fail to have remarked that there is an infinite variety in the forms of trees, as well as in their habits. By those who have observed them as landscape ornaments, trees have been classified according to their shape and manner of growth. They are round-headed or hemispherical, like the oak and the sycamore; pyramidal, like the pine and the fir; obeliscal, like the arbor-vitæ and lombardy poplar; drooping, like the white elm and the weeping-willow; and the umbrella-shaped, like the palm. These are the natural or normal varieties in the form of trees.

Of the round-headed trees that extend their branches more or less at

wide angles from their trunk, the oak is the most conspicuous and the most celebrated. To the mind of the American, however, the oak is far less familiar than the elm as a wayside tree; but in England this tree, which formerly received divine honors in that country, is now hardly less sacred in the eyes of the inhabitants on account of their familiarity with its shelter and its shade, and their ideas of its usefulness to the human family.

It is remarkable for the wide spread of its branches and its broad shade—for its suggestiveness of power, and consequent expression of grandeur. It is allied with the romance of early history; it is celebrated by its connection with the religion and religious rites of the Druids; with the customs of the Romans, who formed of its green leaves the civic crown for their heroes, and who planted it to overshadow the temple of Jupiter; and many ancient superstitions give its name a peculiar significance to the poet and the antiquary.

From its timber marine architecture has derived its most important aid, and it has thereby become associated with grandeur of commerce and the exploits of a gallant navy, and is regarded as the emblem of naval prowess. The oak, therefore, to the majority of the human race, is beyond all other trees, fraught with romantic interest, and invested with classic and historical dignity.

The American continent contains a great many species of oak in its indigenous forests. Of these, the white oak bears the most resemblance to the classical tree, in its general appearance, in the contorted growth of its branches, and in the edible quality of its fruit. But the red oak, the most northerly species, exceeds all others in size. No other attains so great a height, or spreads its branches so widely, or surpasses it in regularity of form. As we advance South, the white oak is conspicuous until we arrive at North Carolina, where forests and waysides exhibit the beautiful evergreen oak, which, with its slender undivided leaves, the minute subdivisions of its branches, and its general comeliness of form, would be mistaken by a stranger for a willow. A close inspection, however, would soon convince him that it has none of the fragility of the willow. On the contrary, it is the most noted of all the genus for its hardiness and durability, being the identical Live Oak which has supplied our navy with the most valuable of timber. At the South, the evergreen oak is a common wayside tree, mingling its hues with the lighter green of the cypress and sombre verdure of the magnolia.

The oak exceeds all other trees, not only in actual strength, but also in that outward appearance by which this quality is manifested. Hence it is regarded as the monarch of trees, surpassing in all those qualities that indicate nobleness and capacity. It is the emblem of strength, dig-

nity and grandeur: the severest hurricane cannot overthrow it, and by destroying some of its branches, leaves it only with more wonderful proofs of its resistance.

THE CHESTNUT

Is one of the most majestic trees in the American forest, remarkable, like the oak, for its broad extent of shade. In some parts of the country it is one of the most common standards in the field and pasture, having been left unmolested on account of the value of its fruit and the comparative inferiority of its timber. The foliage of this tree is dense and flowing, and peculiar in its arrangement. The leaves are clustered in stars, of from five to seven, on short branches that grow from one of greater length. Hence, at a little distance, the whole mass of foliage seems to consist of tufts, each containing a tassel of long pointed leaves, drooping divergently from a common centre of the leaves in the same manner, and by their silvery green lustre giving pleasing variety to the darker verdure of the whole mass.

THE HICKORIES.

There are few vegetable productions of any country which unite so many valuable properties as our hickories or walnuts. Entering, as they do, so largely into the composition of our woods and forests, they contribute to adorn our landscape scenery, supply us with a delicate condiment in their fruit, and from the wood they add very essentially to our domestic comfort, and furnish a material of the highest utility in various arts and manufactures. The prodigality with which it has been applied to these various purposes has had the effect of rendering the above stores of these valuable trees comparatively scarce of late years, as might be expected, and we may have ere long to lament the extermination of most of the kinds, unless some measures of means are resorted to of reproducing them, or a greater degree of economy should be employed in their consumption.

The hickories are valuable timber trees, with large compressed leaves, having from five to fifteen, but usually not more than eleven leaflets. Its fruit is a large, roundish nut, the husk of which opens, partially or wholly, of itself, by four seams.

The hickory is peculiar to America. The nearest approach to it is the European walnut. In many respects it is amongst the most valuable of our trees. It is always a stately and elegant tree; and the several species exhibit so great a variety of appearance and foliage, that they have almost the interest of a forest. Few trees contribute so much to the beauty of the woods in autumn. The colors of all, at that season, are rich, and

each species has its own. The smoothness, closeness, and hardness of the grain of the wood give it great value in the arts, and for fuel it holds unquestionably the first place. The fruit of some of the species, even in the unimproved condition of its forest state, vies with the best of foreign nuts, and it is destined, doubtless, to be greatly improved by the resources of cultivation.

The pig-nut hickory is one of the largest trees in the United States, and is most abundant along the Atlantic States. Its nut is very small, and the shell so hard and thick as to render it of no value. The wood, however, is extremely valuable, as it is considered by manufacturers to be the hardest of the hickory tribe, and strongest, and is in much request for such uses as require strength and tenacity. It is much used for screws, cogs of mill-wheels, rake-teeth, axles, and hand-spikes, for which purpose it is particularly well adapted. Hoops for casks and barrels are always made with us of the young hickory, and it is beyond calculation what quantities are consumed for this object and exportation. For fuel there is no wood which approaches it, and the unlimited consumption of it for this purpose, together with the destruction of the young saplings for hoops, is rapidly causing its extermination. Very little attention, as yet, has been paid in cultivating it, though for the sake of preserving its timber, and the excellence of its fruit, it deserves the care of proprietors of land. They can easily be raised from seed, but it is necessary to plant the nuts while fresh, and soon after they have fallen from the tree; they otherwise lose their power of germination. It is very difficult to increase them by transplanting, as they seldom survive their removal.

The above article was written by C. N. Bement, for "The Horticulturist," in 1864.

THE CONIFERAE.

By L. B. PIERCE.*

The term coniferae is applied to that class of trees that bear their seeds in cones, most of which are popularly known as evergreens. With, I believe, the single exception of the larch (tamarack or hackmatack) all have persistent foliage that is retained throughout the year. Contrary to

* Ohio Farmer, Dec. 17, 1887, p. 290.

the popular belief, however, evergreens do shed their leaves, or "needles," as the narrow foliage is styled, which are replaced by new ones, but this is done so gradually as to give the impression that the same leaves are always clinging to the tree. The mass of needles that covers the ground beneath evergreen forests is, however, partly formed by needles which are never replaced, but drop from inner boughs deprived of light and air by the growth above. The resin contained in them preserves them for years, and in this way quite a carpet of these slender aromatic bits of discarded foliage is maintained beneath a pine forest.

The coniferae are harder than deciduous trees, and mark the limit of tree-growth on mountain-sides and in high latitudes. In Iceland, the only trees to be seen are diminutive pines, less than a foot in height, and these furnish the herds of reindeer with their principal food. A friend who traveled there, tells me that nothing can be imagined more pretty than these little trees, many of them not more than three or four inches high, yet as perfect as trees in this country forty feet high, and he could not resist the temptation to gather them on every ramble, although a very few were all that he could take away with him.

The geographical range of some of these cone-bearing species is very considerable. The American hemlock, for example, grows wild from the mountains of Northern Alabama to the shores of Hudson Bay. The Norway spruce succeeds throughout a large portion of the North Temperate Zone, and is the most generally planted for ornamental purposes in the Northern States.

The propagation of the most beautiful conifers for ornamental purposes has become quite a business in this country, the annual sales amounting to several millions of trees. Growing them from seed in large quantities, is the business of several firms, and special fixtures are provided for the purpose. Where large numbers are grown, a level, suitable piece of ground is planted with posts seven feet high, on the tops of which are laid poles which support a shelter of boughs, which keeps the ground beneath cool and moist, resembling, in a measure, the natural evergreen swamp, or forest. The seeds are sown in a mellow, prepared soil, pressed lightly, and covered with half an inch of beach sand. When the seedling starts, it is very impatient of too much moisture, yet, at the same time, requires constant dampness, and the beach sand just meets these conditions. Like many other plants, the seed comes up, adhering to the top of the just-started tree, and the little birds pick them off, destroying the tree at the same time, so it will be seen that sparrows and finches are serious enemies to the growers of seedling evergreens. In a small way, lath screens are used to cover narrow beds, instead of the more expensive method mentioned.

In Germany, Norway, and portions of the United States, quite a business is carried on in saving the seeds of cone-bearing trees. The cones are thoroughly dried, which causes them to spread open, when the seeds, which grow between the scales are easily shaken out. Large quantities of the more common American evergreens, indigenous in the States bordering on the great lakes, are collected in the swamps and woods when from four inches to two feet in height, and sold to nurserymen to grow to a salable size. In regions where these trees are not found wild, but trees of mature age are found, many little seedlings may be observed in the fence-rows and wood lots, but I have been unable to find any self-sown exotic evergreens, such as the Norway spruce or Scotch pine, although trees forty years old are everywhere to be seen in the vicinity. The fancy dwarf evergreens, and peculiar forms of the larger ones, are grown from cuttings in green-houses. Shoots six or eight inches long are taken in October, trimmed neatly at the base, and inserted in boxes of rich, sandy soil. After remaining in a cool cellar for five or six weeks, they are placed over a gentle heat in a green-house, and by May are rooted and ready for planting out doors.

Evergreens are more difficult to transplant successfully than deciduous trees, because, being in full leaf at all times, evaporation is constant, and draws seriously on the constitution of the tree during the period that the roots have no connection with the ground. No quantity of water will save them when once the water in the resinous juices has died out of the roots. The coniferae, with the exception of the redwood of Northern California, do not sprout from the stump, when cut, but if a single branch is left below when cut off, this will generally bend upright, and form in time a tree as perfect as the first. I once sawed some Christmas-trees, during a deep snow, out of a block of evergreens, and the stumps were allowed to remain two or three years, when I found that the branches left under the snow had turned up, and were making nice trees again. I have now a shapely Norway spruce upon my lawn that was twice sawed off and sold for a Christmas-tree, before removing to its present location.

The largest of the coniferae are the sequoias, or the big tree of California, of which there are less than 200 in the world, all in that State. The next largest is the redwood of Northern California and Oregon, which reaches 14 to 18 feet in diameter, and 200 to 300 in height. It is found in extensive forests, which, it is estimated, would cover the entire ground ten feet deep, if cut into cord-wood. On account of the large swell at the roots these trees are cut at eight or ten feet in height, and these huge stumps present a difficult problem to the farmer, who wishes to clear up the ground. As the stumps do not rot, and renew themselves by sprouting, it is very likely that much of this majestic forest will be allowed to

renew itself. The stumps of much smaller coniferae bother the agriculturists considerably, and the pine stumps of Wisconsin and Michigan often cover a rod square each, with a net-work of roots. They all lie near the surface, and the stumps are lifted bodily out of the sandy soil by means of a powerful screw supported by a huge tripod. These stumps are often made into picturesque fences, by cutting off the roots upon one side, and laying them this side down in a long row, the roots presenting a solid and almost indestructible wall eight or ten feet high. At present, the conifers furnish nearly all of the soft wood lumber used in the world.

DIGGING AND PLANTING EVERGREENS AND THEIR AFTER-CARE.

Mr. C. L. Smith, Secretary of the Minnesota State Forestry Association, Minneapolis, wrote for the Prairie Farmer, Arbor Day number, in 1888, on this subject as follows:

"Have a sharp spade. Prepare a puddle of mortar made with clay and water about the consistency of thick whitewash. In digging, save all the roots you can. Dig a tree and then puddle the roots in the mortar, and put the tree out of reach of wind or sun. The sap in the root of all evergreens is easily coagulated by either sun or wind; once coagulated it can never be restored. Never dig an evergreen and leave it for one minute exposed. In transplanting, keep cool and moist. In setting, straighten the roots smoothly, and carefully work the fine soil firmly about the roots. Be very particular to pack it firmly against the under-side, close up to the center; this should be done with the fingers. When the roots are all covered, the balance of the soil necessary to fill the hole may be firmed down with the foot. Mulch freely with hay or straw for three or more feet around the tree. The mulching should always be deep enough to keep down weeds and grass, and keep the ground moist. This mulching should be renewed from year to year, and then the trees will always look green and healthy, grow rapidly, and abundantly repay the care and attention. Neglect of one single item of care may ruin all."

In an article on Evergreens, published in the Horticulturist,* the author, who signed himself J. H., Long Island, says:

"When the trees are small, a slight protection from the sun's rays will suffice, but we believe our old, well-tried friends, the pines, hemlocks, Norway and white spruce, American and Siberian arbor-vitæ, among larger trees, and the Swedish juniper, erect yew, and a few others, perhaps, will give the best satisfaction. If we plant good specimens of the older kinds, take good care of them and give them the needful training; they are beautiful

* *The Horticulturist*, Vol. XX (1865), page 214.

enough for any one. Too few attend to the training of their evergreens after they are planted. In selecting evergreens, the oftener they have been transplanted the better roots they will have, and the more compact will be their growth—a very essential condition. We do not care so much about the top of a tree, for if wrong it can be righted by cutting back and training; but if deficient or wanting in the lower branches, and the upper branches extend beyond, nothing but severe trimming and some years retarding will bring it to a proper shape.

"If a pine grows long and spindling cut off the leader on the top, and the leaves on the first and second tier of side-branches. Select one of the branches that can be best spared and tie to the stump of the upright shoots. Nipping out the central bud when two or three inches long will answer to make the tree bushy. Spruce and firs will form leaders for themselves, and if the leader shoots up too long, or the upper side-branches extend out too far, so as to overtop the lowest ones, which they should never do, cut the limbs back the same as we would for a fruit-tree or flowering shrub. Spruces, hemlocks and arbor-vitæs can be trained singly by the use of the shears, as we want them, or in the form of hedges, as easily as deciduous trees or bushes."

In journeying through several parts of our States, I frequently observed junipers, whose southern sides were either dead or in a sickly condition. The leaves were of a light-brown color. Farmers called it juniper-blight—a name which seems to be very appropriate—for which no remedy is known. I have seen no case in which the affected part of the tree was restored to life and vigor. The tree in some instances may continue to live for a number of years, but its growth is impeded, its beauty gone. This so-called juniper-blight—although other conifers are often affected in the same manner—is by no means a new disease, as many suppose. Under the heading, "Effect of the drought on evergreens," the Horticulturist, for September, 1864, has the following:

"We have observed very serious effects of the recent drought and scorching sun, on the tender and slow-growing evergreens, particularly the juniper. We have seen beautiful columnar junipers which had been successfully developed by great care, and attaining a considerable height without a mar or blemish, terribly disfigured on the sunny side. This is one among the various trials and vexations that all arboriculturists are liable to, but nevertheless it is one which may be successfully guarded against, by what may be called the ounce of precaution—the pound of cure is, in such cases, almost if not entirely worthless. A tree of this description so disfigured is marred forever, and it is really too bad to see such specimen trees which have so far been carefully tended and well-managed, and just yielding a reward for the labor, spoiled by the want of a little forethought.

"The precaution we recommend is simply this:

"1. To loosen the baked ground for some distance around the trunk of the tree, and then to heavily mulch it with grass or hay or anything which will not readily ferment and evolve heat, occasionally wetting down the mulching.

"2. To place against or near the tree on the sunny side, some branches of evergreens, or even deciduous trees, so as to break the direct rays of the sun and shade the foliage..

"This is a very practical and simple precaution, worth all the cure you can find."

John Jay Smith, of Germantown, Pa., mentions another preventive of such blight in evergreens, which he considers superior to the simple mulching. He says:*

"At the time of planting, or afterwards if it has been neglected, place flat stones about six to twelve inches in size, all over the roots, and they will be kept moist, causing the trees to flourish in the dryest seasons, and also preventing the growth of weeds. By using this simple precaution, and by the use of much rotten leaf-mould, my grand panacea, I have rarely lost an evergreen among the thousands formerly planted at Laurel Hill Cemetery, and lately in the extension of that garden depository.

"The evergreen I prefer is the silver fir (*Picea pectinata*); it has no rival for beauty in youth or age."

TRANSPLANTING EVERGREENS.

BY J. M. ANDERS, M. D.†

By those who contemplate tree-planting, the question is often asked, Shall I plant in the autumn or in the spring season? This question has been discussed considerably within recent years, and writers dealing with it have been much divided in their conclusions, some advocating spring, others fall planting, while still others contend that it is immaterial which of the seasons named is selected, provided that due attention be paid to certain rules as to details. Perhaps the arguments in favor of these two seasons, so far as pertains to temperate climates, are pretty evenly balanced. In the more northern latitudes, where winter is prolonged at both ends, transplanting should be done in the early vernal season. But here it should be an invariable rule to prepare, so far as possible, the soil in the previous autumn, in order to facilitate the setting out of the young trees in the spring.

When it is desired to transplant evergreens, the spring-time should, for various good reasons, be selected, even in quite temperate latitudes. In the first place, as pointed out by Dr. John A. Warder, in an essay on "Forest Trees," "they," speaking of evergreens, "all have more or less persistent foliage, which is usually reduced to the smallest proportions, and so arranged as to have a minimum of evaporating surface; but since these leaves are perennial, they are exposed to the effects of evaporation

* The Horticulturist for October, 1864, p. 313.

† In Forest Leaves, February, 1889, pp. 22 and 23.

throughout the year, winter as well as summer. This will explain why these trees are not transplanted so successfully in the autumnal as in the vernal season." We are apt to think of winter weather as an agency which arrests all organic vegetable functions, and this is, in a great measure, true. The results of my own observations in the past, however, show that transpiration is, to a much less extent, under the influence of such meteorological elements as temperature and relative humidity than strong wind-currents, and especially, sunlight. From these facts, it is obvious that when evergreens are transplanted in the autumn, evaporation from the leaves continues, while the roots, in their new surroundings, are unable to perform at the outset their usual functions. The roots, it is true, may be greatly assisted by being properly placed, and the earth so pressed about them as to obviate air spaces.

Granting, then, that spring is the most favorable season, another reason for failure is to be found in the fact that in taking up the young trees some of the fibrous rootlets are broken off, and thus is established a disproportion between the root surface for absorption from the soil and the leaf surface. Now, to start the tree, under the influence of its new conditions, the leaf surface must be reduced to a corresponding extent, by shortening in the branches. From all this, it follows that great care should be exercised in the digging of evergreens, for transplanting, with a view to preserving from injury as many of the smaller rootlets as possible. High authority tells us that the most favorable season for transplanting these trees is immediately after new growth begins in the spring-time.

If I were to attempt to give rules for the planting of evergreens, I could not offer more succinct, nor better ones, than those laid down by G. Cone, in *The Husbandman*, viz.: "Take the trees up carefully; keep the roots as perfect as possible after digging; puddle the roots well; place carefully in a proper position and cover with fine rich soil (not manure), well pressed down; mulch with saw-dust, coarse straw, leaves, or anything that will make a good mulch; then let them alone. * * * There may be cases where newly-planted trees may be saved by watering frequently and regularly during a long dry season; but I am convinced, by observation, that scores of trees are killed by watering at planting time, and occasionally afterward, where one is saved by it." He continues: "I have several thousand trees and bushes on my place which I have planted with my own two hands, including red and white cedar, white pine, Norway and native spruce, black walnut, butternut, maple, and all manner of fruits. I have learned by experience that if we plant trees (any kind) properly, it is no more unreasonable to expect them to grow than if we plant so many hills of corn or potatoes."

In conclusion, I desire to urge a more general planting of evergreens. It has been well said that a landscape, without evergreens, seems incomplete and unfinished, and this is especially true in ornamental planting. Their value as shelter, as windbreaks, and as sanitary agents, is everywhere acknowledged to be unsurpassed. A final point to be made is, that in the observance of spring Arbor-Day, evergreens should find a conspicuous place among the species planted.

PHILADELPHIA, *February* 5, 1889.

EVERGREENS;

TRANSPLANTING IN THEORY AND PRACTICE.*

BY CHARLES F. GARDNER.

The true theory of transplanting, in my judgment, is as follows: The natural proportion of the top and root must be preserved; cut off as much of the top as is necessary to counter-balance the loss of the roots. The roots must not be exposed to the action of the sun and atmosphere for any length of time, and must always be kept moist. The tree should be set but little deeper than it formerly grew. The earth must be well firmed, so that the tree will stand almost as solid as before its removal. Persons who understand the nature and habits of evergreens, can move them with impunity at any season of the year when the ground can be worked freely. Some writers do not acquiesce in this, as they except the months of July and August. In this latitude I make none. So much for theory.

PRACTICE.—The next thing is to apply this theory to practice, as regards pruning. It must not be neglected, no matter if the trees present an unsightly appearance for a year or two. Dormant buds will spring forth, and the whole top will soon be clothed with a rich foliage. Most evergreens have a resinous sap, which, in its natural state, is thin and limpid. When it is exposed for a short time to the action of the atmosphere, it becomes thick and turgid—a gum, in fact. Further exposure to heat produces resin. Once thickened by exposure, it ceases to perform its functions as sap, and no subsequent watering will ever revivify it.

* Paper read at the meeting of the Iowa State Horticultural Society. Published in *Prairie Farmer*, Feb. 4, 1888.

METHOD OF TRANSPLANTING.—I have seen it recommended to plant trees deep, for the purpose of staying the tree. To prevent its being swayed to and fro by the wind, in my judgment, however, it is much better to plant just a little deeper than the tree stood in the nursery or forest, and reduce the top to gain the point desired. I wish to speak particularly of the method of firming the earth around large trees. In standard works on this subject, we read about placing the earth in its proper place with the fingers, carefully placing each root in its position, and fingered the earth in the interstices. Now, the fact is, that it is almost impossible to do the work well in this manner, while there is another way to do it better, and with one-tenth the work. Dig the hole as generally recommended, fill it half-full of water, throw in fine earth, mix it well, keep throwing in fine earth and mixing it together until you form a mortar about as thick as very thick paint. Into this set your tree, and throw in some fine soil, enough to cover the mortar; gently pat it with the back of the spade, and let stand for half an hour, then fill up the hole with earth. In this way the tree is almost as solid as it was before it was removed. Always leave the top layer of soil loose, so it will not bake. I have said that I make no exception to the months of July and August. The reason why I do not is, because I transplant during these months with complete success. The later the season, however, the greater must be the care that the roots are not exposed. If the tree is transplanted after the new growth has attained a considerable length, it is necessary to cut it back to two inches or less; many losses occur from lack of proper pruning. I think that the cedars and arbor-vitæ do better when transplanted during these months than earlier in the season, but under no circumstances allow the pruning to be neglected.

PRUNING.—The best time to prune them is just before they are dug, and if not done then, as soon thereafter as possible. I prefer clean cultivation to any other method. The second best plan is mulching with straw, hay or leaves, when they can be procured without too much expense. Very small trees should never be planted on lawns or on grass ground. For such places the trees should not be less than three feet high, after pruning.

After all that has been said on this subject, I am aware, that in the majority of cases the nurserymen cannot carry out this theory except in his own planting. A customer orders a tree of particular size and shape. If the nurseryman shears that tree as it should be sheared before shipment, the customer will not take it. He considers it spoiled, ruined, and would not have such a tree on his ground if you would furnish it for nothing. The consequence is that nurserymen ship their trees without pruning,

and give their customers good advice about doing so after they receive them. In nine cases out of ten this advice is not followed, and the result is that the trees, if they live at all, linger between life and death for several years before they can recover from the effect of having a preponderance of top. This method of procedure also causes the nurseryman to receive the curses of his customer instead of his blessing. I have, by way of experiment, set out Scotch pine five to six feet high, cutting back the top to three feet, and shortening-in all the side branches, and all the roots (laterals) cut back to two inches. In no case have I lost a single tree by such treatment, and the way the dormant buds will spring forth will surprise one who never made the experiment. Of course the more roots left on the tree the better will be the result. The three most important points to observe are—

1. Keep the roots moist every second of time while the tree is out of the ground.
2. Have the top cut back to correspond with the loss of the roots.
3. Have the tree well firmed when set.

EVERGREENS FOR PROTECTION FROM WINDS AND BLIZZARDS.

By E. H. RICKER, ELGIN, ILL.

One of the most important subjects at the present time, to the farmer on the prairies, is trees for protection from the terrible winds. To the majority of farmers, the growing of a shelter belt of evergreens seems almost impossible, or that it will take a lifetime to grow them from small plants to a sufficient size, to be of any value as a shelter-belt; or that the expense will be so great that a person with limited means cannot afford such a luxury. But all this is a mistake. A shelter-belt of evergreens is not a luxury, but a necessity. It is what no farmer on a western prairie farm can afford to do without; the expense is very small.

There are several important features to bear in mind in growing small evergreens on the prairie, where they are exposed to the sun and hot, dry wind in summer, and the cold, dry winds in winter. Use nursery-grown plants; it is folly to purchase those pulled from the swamps of Michigan or Wisconsin, and expect to be successful with them. There are reliable

nurserymen through the country who grow evergreens from seed. When so grown, they are more exposed to the sun and wind, and will bear transplanting and thrive, where, under the same circumstances, plants pulled by the handful from the shady forests and swamps, would be almost, if not a total failure. The best sizes to use are those which have been one or two times transplanted; they will need no protection from the sun, and, as a general thing, will give better satisfaction to the planter. They cost much more than seedlings from the seed-bed; but to those who would prefer to purchase two or three years' growth rather than to wait for small seedlings to grow, it would be advisable to do so, but to those that have but limited means, and cannot afford the immediate expense for large plants, may have small trees growing with a very little outlay. Small seedlings are just as sure to grow if properly handled, but all evergreens must be carefully handled from the time they leave the seed-bed until they are well established where they are to permanently grow. The next is, how and when to begin; decided on what kind and how many trees or plants you want; send your order to some reliable nursery where the evergreens are grown from seed; that there may be no delay in receiving the trees at the proper time for planting; this is very important.

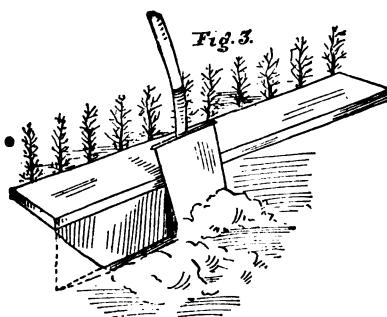
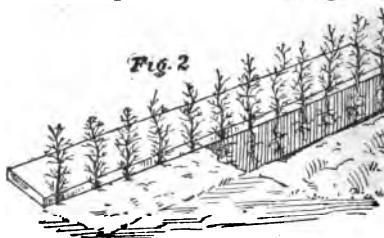
As soon as spring opens, and your garden has become dry so the soil will work mellow, and is not the least soggy, select a place where the soil has been well worked to some hoed crop, and as free from weeds as possible, plow or spade deep, rake very fine and level; this should be done at least a week before the time of planting, that the ground may become settled, so that the trench can be cut without caving down at the sides.

When the trees or plants are received from the nurseries, unpack them in a cool, shady place, out of the wind—in a cellar is the best place; have a pan or pail filled with mud and water about as thick as paint, in readiness, before you open the bundle or box of trees. The chill should be taken off the water before mixing; stir up well, take the plants, a small handful at a time, and dip the roots into the mud and water; see that all the roots are well covered with it, and do not get the mud on the foliage, or top of them. Lay the plants into a box, pan or hand-barrow, have some fine dirt in readiness, and sprinkle over the roots as you dip them, covering each layer as you put them into the box, pan or barrow. After you have unpacked and dipped all the plants, and have the roots protected as above, proceed to the place of planting. If the plants are large seedlings or small transplanted stock, they should be planted in beds in the following manner: Drive a stake at the corner of the bed, fasten to this a strong garden line, stretch it along one side full length of bed, here drive another stake and fasten the line to it, drawing it tightly; from the last stake driven, measure across the bed four feet, and drive another stake,

stretch the line from this to the other end of the bed and opposite the first stake driven, measure off four feet and drive another stake, to this fasten the line, drawing it tight; see that the stakes are so driven that the line will be just four feet apart at each end of the bed. If large seedlings or small transplanted plants are to be planted, take a board ten inches wide and five feet long, lay it across the end of the bed on top of the lines, and against the stakes at the end of the bed where you wish to begin

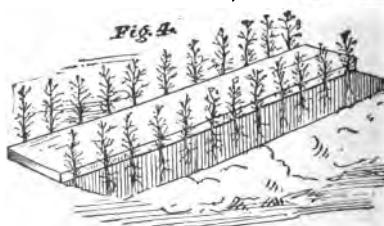
planting; stand on the board, and with a spade proceed to cut the trench, having the side next to board perpendicular, as shown in Fig. 1; after you have cut the trench from one line to the other, take plants, one at a time, in the left hand, hold it up against the bank, and with the right hand push in dirt enough to

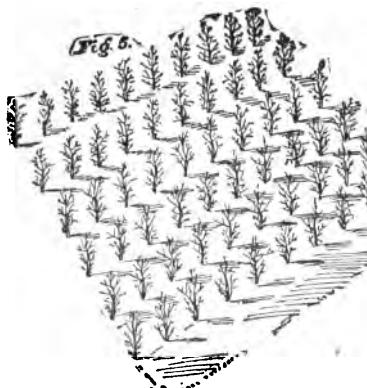
hold it in place; proceed in this manner until the trench is filled with plants, as shown in Fig. 2. Fill the trench nearly full of the dirt that has been thrown out, and with the foot press firmly toward the bank or side of the trench, making the plants so tight in



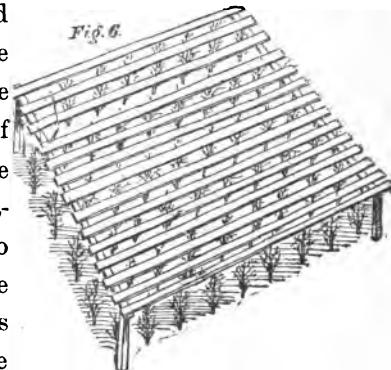
the next trench, as shown in Fig. 3. After cutting the trench from one line to the other, proceed to put in the next row as shown in Fig. 4. Proceed in this manner until the plants are all planted, and the bed will appear as shown in Fig. 5.

the ground that they can hardly be pulled out. This is the secret of success with small evergreens. After you have the row firmly tramped, take the garden rake and rake the fine dirt that has become scattered, towards the row of plants until the bed is perfectly level again; take up the board and lay on the other side of the trees, and cut the

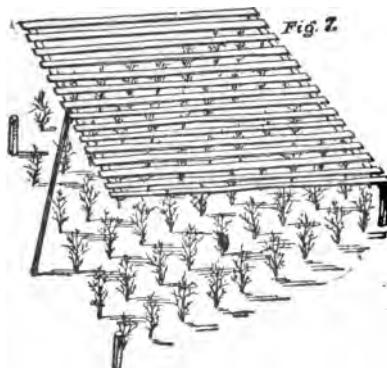




fourths of inch apart. The shades should be made and ready for use before the planting is commenced, and put over the trees as fast as the planting is done. If this be inconvenient, sprinkle a little coarse wild hay or straw over them lightly, until the shades can be made; but do not leave small seedlings exposed to the sun when they are first planted, as at this time they need the most protection (the same as a cabbage or tomato plant); the shades should be left on during the first summer. On the farms where the winds are constantly blowing, as the writer has often seen it in different parts of Kansas, Nebraska, Dakota, Minnesota and Iowa, a good plan is to take common boards, twelve inches wide, set these up edgewise, making a pen around the entire bed, put the lath-shades on the top of these boards; this will protect the little trees from the dry, hot winds in summer, and in the fall, when freezing weather comes, take off the shades and fill the pen, made by the boards, full of straw, and put the shades back over and fasten down, so that they cannot blow off. This will protect the trees through the winter from hard freezing, which is very important, until the plants get old enough, and the wood hard enough, to withstand the cold winters of the northwest. In the south and southwest, this latter protection is not necessary. It may be well to give an idea of how much ground is required for a given number of plants. By planting the plants two inches apart in the rows, there would be twenty-five plants in each row across the bed; for large seedlings or small transplanted plants, the rows should be ten inches apart, using a ten-inch board, as described in Fig. 1, with the rows ten

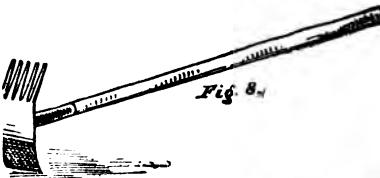


inches apart, and the plants two inches apart in the rows; a bed four feet wide and thirty-five feet long will hold one thousand plants. If small, one-year-old seedlings are to be planted, the rows may be five or six inches apart, and the plants about one inch apart in the rows; at this rate, a bed eight or ten feet long will hold over one thousand trees. In this manner over one thousand evergreens can be growing on any farm in the United States, with an outlay that will not exceed ten or fifteen dollars, the total cost of trees, shades and planting. During the summer the trees must be kept free from weeds and the ground well-worked among them so it will not become hard and dry. While hoeing and weeding the shades may be laid to one side, then put back; they should not be left off but a short time, or they may be raised up at one side and held up with a stick, as shown in Fig. 7.



The best and handiest hoe to use is a small one, about three inches wide, as shown in Fig. 8, as the soil can be worked up close to the little tree with the rake-side better than any other tool we know of. Lang's weeder is also a very useful tool in weeding small plants. If plants that have been transplanted and are twelve or fifteen inches high are to be planted, it is best to plant them in rows

in the garden and let them grow two years before planting them out, where they are to grow permanently. Stretch



the garden line across the garden and cut a trench along it, as shown in Figs. 1 and 3, and plant as above described, putting the plants four or six inches apart in the row, and the rows twelve to eighteen inches apart. Cultivate with a hand cultivator, hoe well and keep free from weeds, and the growth they will make in two years will be surprising. After they have had two years' growth, plant where you want your shelter belt; have the soil in a good, mellow condition, just as you would to plant corn; cultivate as you would corn, hoe them thoroughly; do not let a weed grow near them.

The trees should be planted in rows around your buildings or orchards, from four to eight feet apart each way; the more rows the better shelter-belt you will have. The time to do the transplanting is when the ground is warm enough to plant corn; every farmer will know when the

is; evergreens should not be planted until the ground is warm. The above instructions apply to all varieties of evergreens.

But the next question is, which is the best variety for a shelter-belt? As we have said above, we do not wish to mislead our readers with some new idea, but will simply tell you what has been done, and then each can be their own judge. Nearly all the thrifty-growing evergreens are valuable as a shelter-belt where they are hardy, but the tree that has stood the test, and has proved the most valuable, as a tree for shelter, is the Norway Spruce.

It is hardy, is adapted to prairie soil, and where it has been properly handled and well cultivated has given perfect satisfaction. It is a tree that commends itself, and all that is necessary is for the people to become acquainted with it. As we have had an opportunity to know this tree and see it grow for many years, we feel fully capable of telling our readers its value as a protection. However, in this article we cannot tell or illustrate all we would like to for lack of space, but will give a short history of the Norway spruce in this vicinity.

The illustration of a row of Norway spruce, as shown here, is engraved from a photograph taken some two or three years ago in the Elgin nurseries. They were planted by Mr. D. C. Scofield, a resident of this city. He was upwards of fifty years of age. At that time this country was new; the farm selected by Mr. Scofield was about one and-a-half miles west of this city, on the open prairie; not a sod had even been turned—it was the virgin prairie. Mr. Scofield started the plow; got a piece of ground in as good condition as possible in the tough prairie soil; the next year he sent his order to a large nursery firm in Scotland for a quantity of small Norway spruce seedlings, there not being any nurseries in this country at that time where the Norway spruce was grown in large quantities. They arrived after being many weeks on ocean, and thence by rail from New York to Elgin. On their arrival they were unpacked, and treated and planted as we have explained and illustrated above. Mr. Scofield tells us that not a plant failed. These plants were



NORWAY SPRUCE.



Shelter-belt of Norway spruce along a roadway in the Elgin Nurseries, Elgin, Ill.

two years old at the time of planting. At the expiration of ten years, accurate measurements made by the Horticultural Society of Illinois, as recorded in their report, showed that many of them were over two feet in circumference and over twenty feet high; measurements recently made show many of them to be six feet ten inches in circumference and seventy-three feet high, and for twenty-two years they have been a protection against the fierce storms of this climate. Although Mr. Scofield was upwards of fifty years of age at the time of planting, he still enjoys the benefits of this magnificent shelter-belt. His experience proves that a man past middle age may enjoy many years of pleasure and profit, as a result of his foresight in planting evergreens for protection.

At some future time we shall tell our readers about the value of Norway spruce as an ornamental hedge. We recommend it as the best for shelter-belts. The next in order is the American arbor-vitæ, red cedar and American white spruce. White, Scotch and Austrian pines are reliable evergreens, but we do not recommend them for shelter-belts.

ORNAMENTAL TREE-PLANTING.

More than twenty-four years ago, the editor of the *Horticulturist*, quoting the *'Country Gentleman'*, said* under this head, and these remarks are applicable to-day :

"In traveling through the States of the Union we find that all other kinds of improvements take the lead of ornamental planting. The Eastern States afford many a fine example of perfect skill in landscape gardening, but, as we go west, these instances become more and more rare. We once drove many miles through different parts of a western city, containing beautiful buildings and many thousand inhabitants, in order that we might be refreshed with the sight of a garden, but not a single one truly deserving the name could be found. No wonder that Lord Bacon should have remarked, centuries ago, that 'When ages arrive at civility and elegance, men come to build stately, sooner than to garden finely, as if gardening were the greater perfection.'

"We should like to show some of our countrymen who appear to hate or despise trees, what kind of an earth we would have without any, by placing them for a moment in the midst of the great desert of Africa, where all they could see would be 'a wild expanse of lifeless sand and sky.' We think they could hardly avoid admitting, that the coolness of a shady grove would be preferable."

The practical conclusion to which we arrive is :

1. Be extremely cautious in cutting down a tree. It has, perhaps, been a century in growing, and it will require another century to replace it.
2. Do not procrastinate in tree-planting; put off any other work, but do not neglect this, because every year lost is an equal loss in refreshing beauty to every man's life. Get the trees started, and they will grow while other matters may be attended to. Make your arrangements for planting now, and be ready in season.

ROADSIDE TREES.

On this subject, which has been discussed in former reports, E. J. Brownell, of Delaware county, N. Y., writes to the *American Rural Home* September 1, 1888, as follows :

Desiring that others should follow the example of some of our more thrifty farmers throughout the State, and thinking that perhaps a few words on the subject of tree-planting might stimulate some to go and do likewise, has prompted one interested in the success of our farming community, to forward you the following, embracing my views on

* *The Horticulturist*, (July, 1864), p. 230.

this subject. At the present day the farmer is anxious to receive as much for his labor and as large a per cent. for cash invested as possible. Of all the avenues where labor and capital are employed, none can pay better interest than the planting of trees by the roadside or along the public highway.

The number of years the average farmer is able to do manual labor on his farm, is sufficient time to mature either the common apple or pear, or the beautiful maple, elm or any of the many shade trees that are now grown in the nursery. The land along the highway fences retains much fertility, and readily grows the noxious weeds, briars, thistles, etc., while they in turn are filling the neighboring meadows and pastures with their unprofitable seeds, which give the husbandman so much trouble in subduing. This is just the site for the row of fruit or shade trees, either of which would, in a few years' time, sufficiently mature to produce an income, besides adding so much to the beauty of scenery and comfort to the traveler, if the trees were cared for, pruned and kept free from insects.

Not only does the farmer receive abundant fruit for his labor and trifling capital invested, but the weary traveler blesses him as he journeys along, feasting his eyes during the spring upon the bursting foliage and beautiful blossoms, and later in the year, upon the hanging branches loaded with luscious fruit, or in the heat of summer enjoys the refreshing shade of the maple, elm or willow.

Already the Western States are reaping the benefits of tree-planting, both in an increased fruit and timber production, and is believed by many able scientists, in an increase of rainfall caused by forest growth, and our own State is awakening to the importance of encouraging the farmer, by way of premiums, to plant trees along the roadsides to act as windbreaks, and in a measure to repair the havoc made by the woodman's axe. The writer is not an old man, and he beholds with pleasure the trees planted with his own hands, now of sufficient size to bear a good crop of fruit, and maples large enough to produce a good yield of syrup and sugar, and soon a portion can be cut to supply no small amount of the kitchen fuel.

Now let our farmer friends give this subject the attention it deserves, and resolve the coming season to plant a line of either orchard or shade trees along the highway, running through their farms, and in fact on many farms there are rocky hillsides and out-of-the-way places, where nothing of value is now produced, which, by giving a little attention to tree-planting, might be made even more valuable than other portions of the farm. In planting trees, as here suggested, the nut-bearing trees should not be overlooked, care being taken to select such varieties as are suited to the locality where planted.

Mr. A. C. Hammond, Secretary of the Illinois State Horticultural Society, says in *Prairie Farmer*, April 7, 1888:

For street and roadside planting, nothing is equal to elm, sugar maple and catalpa. Some of my correspondents object to planting by the side of country roads, on the ground that the shade will prevent the rapid drying up of mud after rains; but in these days of tiled and machine-made road-beds, this objection is not worthy of consideration. We would urge upon every landowner the duty of planting, as a means of enhancing the value of his property, as well as adding to the beauty of the country. The mistake is often made of planting too close; sixty feet is the minimum distance which these large growing trees should be set, and possibly eighty or one hundred would be better still.

Mr. J. F. Bowman, of Clarke county, O., is partial to the Norway maple, for he writes to the *Prairie Farmer*:

The Norway maple (*Acer platanoides*) is perhaps the most valuable and attractive deciduous tree for street or ornamental planting. It will endure a temperature of 30 or 40 degrees below zero and is perfectly hardy. It grows slowly the first two or three years

after being transplanted from the nursery. The tree forms a very handsome "head;" the leaves are large, glossy, and a beautiful green, varying from light to dark in different individuals, thus making a beautiful contrast. It is little known in this country, and has not received the attention it deserves. One reason is, that it is difficult to produce trees large enough for street planting in less than four or five years. Nurserymen prefer trees of more rapid growth. As its value becomes better understood, and the demand for it increases, nurserymen will give more attention to its propagation. Other maples are sometimes supplied to those who are unacquainted with the Norway maple. We bought a lot a few years ago claimed to be Norway maple, but on comparing them, found them very different from our European importations, freezing down to the snow line every cold winter.

"Were it not," says the eminent Prof. L. H. Bailey, "for the fact that the roadsides are usually neglected, or country highways would be things of beauty. Every landowner should have his roadside planted."

ROADSIDE TREE-PLANTING.

In due recognition of the fact that the planting of forest-trees, on a small scale, must necessarily precede the planting on a large scale—and that the successful planting of a few trees will tend to stimulate a desire for planting more—the State Forestry Bureau always endeavored to encourage roadside tree-planting, and discussed the subject in one of its former reports.* Since then, and as a direct result of the careful study of the ideas advanced in the several papers on that subject, many miles of roadsides in Ohio have been lined with forest-trees. To keep up this interest in roadside tree-planting, and to create such an interest, where now, it does not exist, we beg leave to quote from the "AMERICAN RURAL HOME :"†

The subject of public rural improvements is receiving considerable attention, especially in communities where there is a concentration of population. Attractive scenes of cultivated landscapes are to be desired in every locality. Increased interest in public rural improvements is being obtained gradually by accumulation of individual efforts, whereby every citizen should be made to see the importance of ornamenting the highways by the planting of decorative trees. The prominent attraction of all country scenery is in the trees and the shade afforded by them, offering cool retreat beneath spreading boughs, whose leaves impart freshness and vitality to the surrounding atmosphere. The benefits derived from the preservation of forest-trees, in new townships, cannot be too urgently set forth, especially those adapted for public avenues. Their early removal in many eastern settlements subjected the roadways to the influences of a clear warm sun, of sweeping winds and washing rains. The organic deposits have been so dried up or washed away that it is impossible for nature to restore the stately growth of the forests, or the pristine richness of the soil.

* See Second Annual Report Ohio State Forestry Bureau.

† Roadside Tree-planting, by Jos. H. Bowen, A. R. H., January 19, 1889.

In beautifying highways that have no shade by planting trees, we must, therefore, disregard early returns for future benefits to be conferred, recognizing influences in their protection as windbreaks, fertilizing effect of their shade, annual deposits upon the soil, their radiation of heat in winter, its absorption in summer. Judicious improvements, of course, must very much depend on the natural character of the locality where many of the public drives comprehend both the rural and the beautiful in scenery.

In the various combinations of landscape no natural object is more useful than water, the view of which, on account of the delight received, should never be interrupted by umbrageous shade. Townships of land with roads and streams, dotted with permanent and suburban homes, church spires and school-house towers, farm fields, pastures, woodlands and hills, all form a park to ride in, walk in and enjoy. Rural improvement societies are, therefore, desirable organizations for promoting highway tree-planting in a manner that will secure the greatest benefits and highest happiness. Treeless roads should have shade because they are tame and monotonous; but to attempt the varieties of park scenery on an avenue would not be in good taste. Single species of trees only are much more effective on straight roads, and all trees, as a rule, that are planted in highways should come early into leaf, bear no disagreeable blossoms and never be planted too close together. The elms, maples, horse-chestnuts and white ash, deciduous trees, are now most commonly employed for shade and wayside planting; for wide avenues the silver maple, sycamore and silver poplar are often effective. Varieties of birch make admirable borders for streets that are too narrow for elms, and in which maples make too deep a shade. The tall, broad and pyramidal tulip tree, or white wood, makes an elegant street tree, and will grow rapidly when once established in a rich, warm soil. The weeping white birch and white pine, in light soils, and Austrian and Scotch pines are very appropriate and flourish near water lines. Purple willows like high sandy soil, and red cedars grow in bleak places on the poorest land. The buttonwood, which is such a favorite decorative tree in Germany and France, is esteemed by our people only as a break from strong water breezes. The white willow is adapted to damp exposures and the sea shore, but the chestnut and hickory are too difficult to transplant to be useful. The beautiful and vigorous growing chestnut is too wild a tree for the roadside, and prefers a high, dry soil. Oaks in full vigor are sublime, but grow too slow to be popular; besides are delicate in choice of soil, liking a warm, deep, black, fast mould in elevated situations. The ash grows finely on the banks of rivers and edges of swamps, but its leaf is rather tender and early receives impression from wind and frost.

A moist surface soil is very congenial to the American elm, and autumn fertilizing greatly stimulates its growth. Many of the diseases that attack old elms are the result of a weakening vigor caused by a lack of good, fresh soil or stimulants on the roots. The English and Scotch elms both unite the best qualities for a street tree and flourish in deep loamy soil. Ground bone or bone and potash in moderate quantities, thoroughly mixed with the soil, is an excellent fertilizing material for all ornamental trees. Vigorous young trees, three feet high, will often make finer specimens than those of larger growth, if soil preparation and care be equal. Pruning should be properly performed when the wounds will begin soonest to be covered; all of the shoots and branches should be given a due portion of air and sunlight in order that the tree may maintain a vigorous form agreeable to the eye and advantageous to the development and display of its foliage.

No method has been devised where the planting of shade and ornamental trees upon town avenues can be performed so thoroughly and satisfactory as by organized rural societies. Interest is increased by meetings for discussion where plans are suggested and means furnished for the accomplishment of future projects. Interest in tree-planting is certainly a common one, and the work is made easy when once a taste for nature is created. The general observation of arbor days must be a great assistance towards embellishing towns and villages with graceful foliage. Trees should be planted for the charm which they lend the landscape and the practical benefits they confer. With this object always in view, we must, at the same time, keep in mind that the love for trees is often too extravagantly bestowed.

In answer to the question, "WHERE TO PLANT?" Prof. N. H. Egleston, of the U. S. Forestry Bureau, at Washington, says: * "We name, not so much on the score of profit or advantage, as of comfort and taste, our common roads and the streets of our cities and villages, as appropriate places for the planting of trees. What else is there that gives such a charm to many of the villages in the older parts of our country, and especially to many of the New England villages, as the lines of noble, graceful trees which border and overarch their streets, and whose beauty every one sees and feels? The beauty and charm are so manifest to the dullest nature almost, that as population has spread into newer regions, roadside planting has been often repeated. In many cases, however, there has been neglect in this particular, and in all parts of the country there are places where, by a comparatively little expense in planting the proper trees along the street-borders, villages and towns, now unattractive and even forbidding in appearance, perhaps would be transformed into inviting places of residence. The whole tone of society would be perceptibly improved in a few years, as, following the appearance of the trees, one change after another would come in for the better."

"But," Prof. Egleston inquires, "Why should not the highways that lead from village to village, and from town to town, have pleasant borders of trees as well as the village streets? How pleasant would be their screen from sun and wind oftentimes! What a preventive of the annoyance of dust, and how grateful to the sight their varied forms of grace and beauty! In some European countries the planting of trees by the roadside is made obligatory by law."

That the laws of several States encourage roadside tree-planting, by offering a bonus, in the form of a premium, which is paid in money or deducted from the road tax, is well known, but it has, I believe, not been made obligatory in any State, except to some degree in Michigan. It may, therefore, appear rather strange that a suggestion to this effect should come from one of the most wooded States—Michigan—yet such is the case. Thus Mr. B. W. Steere, of Adrian, Mich., writes to the Forestry Commission of that State: † "I suppose the only legislation practicable at present, would be in reference to roadside planting, as continuous rows of trees on both sides of all highways would be a great protection, and perhaps ameliorate the climate somewhat, with but little loss of land. Therefore, would recommend a very stringent law, with heavy penalties, requiring landowners to plant such rows, within a given time, the trees to be not less than *thirty* feet nor more than *sixty* feet apart; with a fine of \$25 for failure to plant, and \$10 for each tree cut down, whether transplanted or

* Hand-book of Tree-planting, p. 45.

First Report Michigan Forestry Commission, 1888, p. 65.

native, provided the space left between the remaining trees is more than sixty feet, as every alternate tree could finally be cut down without violating the law. It should be made the duty of the overseer of highways, or some other officer, to notify all landowners of the law within a given time of his election, also to prosecute, collect fines, in *every* case of violation; himself, to be fined, not less than twenty, nor more than fifty dollars for each failure of duty, the money in both cases to go to benefit the district."

Without doubting the benefits which would result from the enactment of such a law in Ohio, I would advise to pay a premium on roadside tree-planting, rather than impose a fine for neglecting to plant. But, in consideration of the fact that the public sentiment is favorable to roadside tree-planting, and, that the annual observance of ARBOR DAY affords ample opportunities to nourish this sentiment, there seems to be no immediate necessity for legislative enactments in that direction.

The general intelligence of the people of Ohio will not be slow to perceive and appreciate the good effects of roadside tree-planting.

CULTURE OF FOREST-TREES.

BY WALDO F. BROWN, OXFORD, O.*

PROPAGATION OF SEEDLINGS.

I would advise every farmer who is intending to plant an acre or more of timber, to grow his own seedlings, for, with only moderate success, he will not only find it cheaper than to buy them, but he will also be sure to have them when wanted, and can take up a few at a time, and plant them without the roots dying. I have had many years experience in growing locusts and soft maple, and can give such plain directions for managing the seeds and young plants, that success will be almost certain.

Select clean, rich land for your nursery, for the young trees come almost as delicate as melons, and for the first few weeks need as much care as a bed of beets. I have often been asked, "Why not sow the seed where the trees are to grow, and save the labor of transplanting?" T

* This paper, which appeared in Farm and Fireside in July and August, 1887, is one of great interest to students of forestry. Mr. Brown is an authority on the culture of Black Locusts and Maples, having more than ordinary experience in the culture of those trees. A.

answer is this, that it would be next to impossible to start seedlings at all on such land as we generally wish to plant in timber, for we set out the waste places of the farm in trees, side hill, from which the soil has been washed, corners cut off by creeks and ravines, or heavy clay spots too wet to cultivate profitably; and while a tree that has good roots started in the nursery, will thrive on these spots, a seed-bed could not be made fit to start the young plants. Even if they could be grown on the ground where they are to stand, the extra work of caring for them would be greater than the transplanting. About 400 trees can be grown to the square rod in a nursery, as they will grow five or six to the foot of drill, and five rows to the rod; and as we plant but from twelve to sixteen to the rod, it will take but a small nursery to grow enough trees for an acre.

THE BLACK LOCUST.

My experience in growing seedlings is confined to locust and soft maple. The seed of the locust can be had of most seedsmen, and should not cost more than one dollar per pound, postpaid, but any one living where the locust grows, can gather his own seed. It will take less than a bushel of pods to make a pound of seed, and it can be threshed easily with a flail or small stick like a lath. The seed must be scalded so as to swell it before sowing. I pour water almost at the boiling point, over it, enough to cover it. A pint of cold water poured into a gallon which is boiling, will give about the right temperature. Usually, but a small per cent. of the seeds will swell from the first scalding, perhaps one in eight or ten, and these seeds will be four times as large as the natural size. Before scalding again, these should be separated. If one has but a small amount, they can be picked out by hand; but with a mason's sieve with six meshes to the inch, the seed which has not swelled can be sifted out, and the swollen ones retained. Whether to be hand-picked or sifted, the seed should be spread in the sun and dried, but should only be left just long enough to dry the outside. The swelled seed should be put in a damp place, and covered with a wet cloth, and scalding water at once applied a second time to the remainder. This time, usually a much larger per cent. will swell, and sometimes two scaldings will be all that will be necessary; and again, I have scalded five or more times. The swelled seed is ready to be planted, and will come up as readily as corn. Be sure to make the rows straight in which to sow the seed, for it will save much labor in cultivating them when small. Clean them out, and keep the land well worked as soon as you can see them in the row, and in a few weeks you can use the horse, and the cultivation will then be easy. They will grow from three to five feet high the first summer, and be plenty large enough set out at one year from planting.

THE SOFT MAPLE

Is easier to manage. The seed ripens in May, and in early seasons before the middle. I am gathering a little to plant to-day, (May 12). The seeds should be planted at once, before they dry, and will come up in a week if weather and soil are favorable, and the trees will grow larger the first season than the locust. I have seen them on good land, when not crowded, grow six feet tall the first summer, and nearly an inch in diameter where the stock joins the root.

TRANSPLANTING.

Always transplant either variety at one year old. I should rather pay \$10 per thousand for good yearlings, than to take two-year-old as a gift. A tree put into the plantation at one year old, will be larger and better at three years old than one not transplanted until it is two years old, and two hands will set out a thousand of the small trees in a day easier than they can two hundred of the large ones.

MANAGEMENT OF SEEDLINGS.

The land, on which the trees are to be set, should be plowed and harrowed as if for corn, then lay off the rows with two horses and the large breaking plow, and it may be necessary to go twice to a row. The furrow should be deep enough so that no digging will be necessary, and fine enough so as to be put to the roots without any unnecessary work of pulverizing. In planting, a boy holds the tree perpendicularly in the furrow, and two men, either with hoes or light spades, cover the roots with soil, and press it firmly with the feet.

It pays to set the trees quite thick, as it induces a straight, tall growth, with but few side-branches to die and drop off, so that a thickly-planted grove will need no pruning after it is fairly started. I set about sixteen locust trees to the rod, and the first two plantations which I put out were planted in rows four feet apart each way, with the intention of thinning to eight feet, taking out each alternate row and each alternate tree of the remaining row. I found, however, when they were old enough to be thinned out, that the tree I wished to leave was often the poorest one of the four, and sometimes unfit to stand. I have since made four plantings of from one to two thousand trees each, and have made the rows eight feet apart and the trees from two to three feet in the row. When they are old enough to thin we can select and leave the best trees. If there are two within three feet of each other which are straight and thrifty and growing about alike, and several poorer trees next to them in the row, we leave the two and cut out several together next to them; but we aim to leave

about four trees to the square rod, or 640 trees to the acre, to grow into posts. It is best not to thin at all until they are five or six years old, and then only cut out such as are being overshadowed by others. The best of these will make bean-poles, but some of them will be of no value. At about eight or nine years from planting you will thin out to a stand, and most of those cut out will do for fence-stakes.

MAPLE SEEDLINGS,

I would plant a little wider—about 4 x 8 feet—and would cut every other row clean when they begin to crowd, which will probably be not for eight years or more after planting, and by this time they will be of some value for wood. Then thin the rows so as to leave the best trees at the rate of two to the rod, which will give 320 trees to the acre.

GENERAL MANAGEMENT.

It is usually best to cut back both locust and maple trees to the ground at one year from planting, as the trees are well-rooted by that time, and will throw up a stronger and straighter growth than they will the year they are transplanted. If this be done, it will be necessary to go over them and rub off all but one shoot soon after they start, but no after-pruning will be needed.

The trees should receive as clean cultivation as corn the first season, and if they be cut back to the ground the next spring they should be cultivated the second season. A locust plantation may be seeded with grass and pastured with calves the third summer, as the thorns protect the trees; but maples should be allowed to stand two or three years before pasturing.

TWELVE TREE-PLANTING POINTERS.

(From the Prairie Farmer).*

Planting a tree is doing work for *each* of many after years, usually for decades, or for generations—frequently for centuries. Many a tree planted this spring will give pleasure to the eye and shade to the head, all through the planter's own life, through that of children and children's children. Indeed, some of the trees planted out this month, and the tree, will be in stately vigor, and give pleasure to many, a hundred years after the planter, young or old, lies beneath the sod. Ten minutes of extra time and care, or a hundred of

The Arbor Day number of the Prairie Farmer, issued April 7, 1888, which was entirely devoted to Arbor Day work, and contained numerous illustrations, has been of the greatest value to forest-planters, and has probably done more for the advancement of forestry in this country than any other publication.

them, devoted to the best planting and care of one tree, will tell upon its life and upon its value in each of all these many after years. One or a few trees well selected, well planted, and well cared for, during the first year or two, will usually be more valuable than a far greater number hastily set out, and then neglected. In the numerous practical suggestions, from men wise by long experience and observation, which the readers will find scattered all along through the columns of this number, there are a dozen points upon which all agree, and which every reader should promptly and carefully go through with, and study at this seasonable period. We briefly summarize those of most importance: After due care in selecting the best specimens, which are the cheapest in the end.

(I.) In taking trees from nursery or forest, preserve all the roots and fine rootlets possible. Avoid breaking them in shaking off surplus earth, and *dig* them out instead of pulling them up. For this reason, trees from nurseries located on light or friable soil are preferable to those on clayey ones.

(II.) Trees from nurseries where they have been subject to one or more transplantings in their early growth, are usually better supplied with a mass of fibrous roots near the base of the stock, than those from the forest. Incidental to this, especially for all trees over one year old, and particularly for those having a deep tap root naturally, it is better to sever this tap-root within a foot of the surface with a spud (a broad chisel fitted to a handle), or with a narrow spade, early in the spring prior to transplanting in autumn or the following spring. This promotes the growth of a very desirable root mass.

(III.) Most carefully guard the roots from any exposure, even of a few minutes, to sun or wind. Dipping them in a "mud porridge" as soon as lifted, helps much, if this coating be not allowed to get dry. Keep them moist in moving, and if there is to be a day or an hour's delay after arriving and unpacking, heel them in, that is, set them in a trench or opened ground, and cover all the roots with soil until the last moment before planting.

(IV.) Give the roots a deep and broad bed of good soil to start and grow in—a thing easily attained in naturally poor, or clayey, or sandy soil, by digging out a hole of considerable dimensions, and filling in with soil from elsewhere. A little care in this, may manifold the future growth and value of a tree.

(V.) Spread out the roots well and naturally, and set only a trifle deeper than they grew before removal. There are only a few exceptions to this rule.

(VI.) Fill fine soil well in *under* and *around* the roots, and firm it by pressure.

(VII.) Unless the soil is quite moist and the weather damp and cloudy, and likely to be, before filling in the top earth pour in water enough to pack the soil around the roots and to soak down one to two feet, so that there will be no lack of moisture until the new roots are well established with abundant new feeding rootlets.

(VIII.) In after watering, if needed, avoid the "little and often" method. Instead of sprinkling the surface, and thus producing a crusty layer impervious to air and sun, better dig a hole near the base and pour in water enough to soak far down. Moisture will evaporate ten times faster from the top inch layer than from one a foot deep.

(IX.) Unless there is a continuous wet season, a *mulching* of coarse manure, or cut grass, or straw, or leaves, from 2 to 4 inches thick and extending out 2 to 5 feet each way from the trunk, according to its size and the extent of roots, is a very great protection and starter, and usually saves the necessity of much watering, even in a dry season.

(X.) Unless the trunk and branches are very small, or the soil unusually firm, weighting it temporarily with a few stones, or with extra heaping on of heavy earth, to be easily removed, will prevent swaying and rending the tender, newly-started rootlets. It is effect like the present method of enclosing a broken human limb in a casing of solid plaster of Paris to prevent any possible disturbance of the nascent muscles, nerves, tendons and blood vessels. Where winds prevail from any direction, as they usually do, lean the tree little in that direction when setting out.

(XI.) Except with evergreens and ornamental specimens, already shaped to a desire

form, trim and reduce the top fully as much as there has been a decrease of roots and rootlets in the taking up.

(XII.) "Just as the twig is bent the tree's inclined;" and a mar or scar on the infant tree is liable to ever after, visibly or invisibly, affect its beauty or its vigor and its value. So take good care to direct and shape its stem and branches, and protect it from careless or violent hands. If exposed to danger from the careless man or beast, set warning or guiding stakes on either side, and if necessary add protecting cross-slats, or wires, or wire-nettings. If not "inclined" naturally to an upright and comely form, a stake and cords will compel it to follow your wishes and will. Take care to guard against chafing or constriction from the cords.

EMBELLISHMENT OF LAWNS.

The dissemination of information concerning the outward embellishment of homes, is intimately associated with the subject of rural improvements. Trees, shrubbery and vines are planted about our dwellings for the gracefulness of the plants themselves, to hide objectionable features, give privacy to the garden, and relieve the barrenness of too open a lawn. The kind of ornamental work to be done must depend on the size, location and physical features of the grounds, and trees and shrubs should be so arranged that in height and color of foliage the most pleasing results may be secured. Against a tall, dark back-ground may be placed the dwarf and bright-colored shrubs, the light weeping birch in contrast with the dark Nordman fir; by the Norway spruce may stand a weeping silver fir. The horse-chestnut, maple and tulip trees may have standing before them the silvery heads of the white and purple fringe; the weeping hemlock makes a pleasing shadow for the golden yew; hardy rhododendrons, azalias and Japan maples may be arranged gracefully in selected places. Weeping elms, willows and cut-leaved birches are fine as single trees when appropriately disposed of. Cone-shaped Chinese cypresses are attractive in their pea-green color; Japan junipers, elegant in silvery gray, golden and variegated tints. Natural groups should be seen full of openings and hollows, representing trees of advancing before or retiring behind each other, productive of intricacy, variety, deep shadows and brilliant lights. Irregularity is an important requisite in arranging trees around our homes, where the greatest triumphs are those in which, in rivaling nature, she most completely effects her own concealment.

The smaller the lot, as a rule, the less material should be used to adorn the surroundings. A small estate too much cumbered with plantations is liable to be damp, gloomy, and confined, preventing a free circu-

lation of air and sunlight. The plat of every residence can be decorated appropriately with ornamental foliage, if the art of planning is carefully studied. Individuals who have a taste for roaming in the woods and along the rivers and brooks, who have an eye for comely, attractive shrubs and beautiful native combinations, can take home ideas that please, and transfer them to their own grounds. In this way the keenest enjoyment is likely to be derived by developing plans in our way with nature as teacher.—[Jos. H. Bourn, in *American Rural Home*, Jan. 29, 1889.

THE YEW TREE.

(*Taxus baccata*, Linn.)

Although this tree is quite often met with in ornamental plantation, it has, as an object of forest-culture, not received that degree of attention to which some of its qualities would seem to entitle it.

True, it is of slow growth, attaining in ten years from seed—when favorably situated—a height of six to eight feet, and in twenty years about fifteen feet, and it will continue growing for a hundred or more years. Yet when planted among other trees or in masses by themselves, they grow quite tall.

On account of this slow growth it will probably not become a favorite for the production of timber. But, thriving as it does, in the shade and under the drip of other trees, and having a dense foliage, on which no insects live, it may, and probably will, become a favorite as a nurse tree or underwood, especially among trees which are the object of insect depredation, as the black locust, (*Robinia pseudacacia*, Linn.)

About this tree, Loudon says:*

“In a wild state, the yew affords food to birds by its berries, and an excellent shelter to them during severe weather, and at night, by its dense evergreen foliage, but no insects live on it. By man, the tree has been applied to various uses, both in a living state, and when felled and employed as timber. The wood is hard, compact, of a fine and close grain, flexible, elastic, splitting readily, and incorruptible. It is of a fine orange-red, or deep brown; and the sap-wood, which does not extend to a great depth, is white, and also very hard. Where the two woods join, there are generally different shades of red, brown and white. Both woods are susceptible of a very high polish.”

According to Varennes de Fenilles, the wood of the yew weighs when green, 80 pounds 9 ounces per cubic foot; and when dry, 61 pounds 6 ounces. It requires a longer time to become perfectly dry than any other

* Loudon's *Encyclopædia of trees and shrubs*, London, 1842, p. 949.

wood; and it shrinks so little in drying, as not to lose one forty-eighth part of its bulk. "It is," says Loudon, "universally allowed to be the finest European wood for cabinet-making purposes."

The yew tree is, as a rule, propagated by seeds, but may also be propagated by cuttings or layers, and planted in a shady place early in April or in September. If cuttings be made, the leaves should be carefully stripped off the lower part of the cutting, which may be from seven to ten inches in length, and buried to the depth of about five inches in the soil. In about two years they are ready to be transplanted, but may stand in the nursery row for several years longer.

LIFE IN A LUMBER CAMP.*

"Some love to roam o'er the dark sea's foam;
Where the wild winds whistle free;
But a chosen band in a forest land,
And a life in the woods for me."

So sings the woodsman as he shoulders his axe, and with a gang of congenial associates, prepares to pass the ensuing six months in a lumber camp. Descriptive writing on this subject would seem to be a drug when placed in juxtaposition with the exciting scenes of city life, or the usages of more refined and civilized society. And still in the face of the fact that romance and sensationalism might in vain be looked for in a shanty camp, a representative of the Timberman found time to visit and write up a lumber camp. The Timberman being all its name implies—practical—romance will be considered the more conspicuous from its absence, and the sensational be relegated to realms of the unreal, while the reader is invited to pass a brief half-hour in a visit to a Michigan lumber camp. In a recipe for cooking a duck, you are first directed to catch, so in order to see a lumber camp in all its pristine glory, you must first be directed how to get there. Lumbering in the abstract partakes of so much similarity that a description of one camp will do for all, so please imagine Mr. Brown, of East Saginaw—a well-known lumberman—telling one of his many foremen—John Smith—to take a gang of men, and build a set of camps on the Ocqueac River, Presque Isle county, Mich., and prepare to lumber ten millions. To put in this amount of timber in what is called

* The Timberman, Feb. 25, 1888, p. 4.

"the season," extending from September 1 to April 1, requires a camp of 100 men and twelve teams. Of course, the length of the log-road, or "haul," makes all the difference in the world, but a two-mile haul will serve our present purpose.

To pierce the unbroken forest with the necessary supplies for a camp, of the above dimensions, is a work of no small magnitude. The scarcity of timber has drawn the lumberman up on the head-waters and tributary streams of the lumber regions, and many are obliged to "tote" their supplies for a distance of from thirty-five to fifty miles. So the reader will kindly imagine the above gang of men to have found a location in the pine woods, on the opposite side of the county from where they went in, for the winter's operations. The first thing necessary in the locating of a set of camps is water, shelter and convenience to the "cutting ground," so that the time of the men in going and coming to and from their work may be economized. This being thus properly selected, the first thing is to start the cook and the blacksmith to work. These are placed under a temporary shelter of boughs while the work of building the camps goes on. All the immediate supplies for living, together with the tools required for building camps, have been brought along with the men. The "tote-road" to camp has been cut out and blazed from the front to camp, and the "tote" teams are sent back for more, and from the time the men go in till camp breaks up in the spring, not less than three "tote" teams make the daily journey to the "front" for supplies of the men and beasts in the woods. The camp usually consists of four principal buildings, viz., cook and eating camp, 65 x 35 feet; the bunk camp, 60 x 30 feet, with sleeping-room for 100 men; the barn and stable, with stall-room for eighteen teams and room for hay and oats for the same; a blacksmith and tinker shop, where the massive sleighs are made, and all the tools necessary for the woods are made and kept in repair. The blacksmith and "tinker" (wood-worker), are usually good workmen, and must be capable of doing any kind of job in their line. In addition to these buildings, there is what is known as the "van" or office, where the foreman and scaler bunk, and where the clothing, tobacco and tools of the camp are kept. Sometimes the foreman has his wife with him, when a little more effort at comfort and seclusion is made in favor of the lady.

It takes from ten to twelve days to get the camps in condition to live in, during which time the men live a sort of Robin Hood life, under canvas or hemlock boughs. But many hands make light work, and nothing in the way of lumbering is done till the camps are all up and the men and horses are made comfortable. The shanties are built in the most substantial manner, of the straightest logs, neatly scarf'd to fit into each other, "chinked" and plastered in the interstices till all cold is bade adieu.

fiance to. Lumber is necessarily scarce, and the roof and floor are about all that shows the work of the mill-saw, all else are formed from the trees of various sizes, manipulated with no other tools save the axe, cross-cut saw, and two-inch augur. Here for six months are congregated a heterogeneous conglomerate or humanity, of all ages and races, with hard work in plenty, and but little to amuse. A gigantic stove warms up the bunk camp, and the "chore boy" has the bestowal of the heat in the cords of dry Norway he fires up with. Plenty of warm blankets, spread on a bed of hay, fill the bunks, which are built one above the other, along both sides of the camp. A couple of headless flour barrels let through the roof furnishes ventilation, and "nature's sweet restorer, balmy sleep," gives back the health and strength subtracted by the toil of daily labor. The men are usually fed well. The secret of success in the woods is well-fed men, comfortably housed. The following rough estimates will show the quantity of provisions consumed by a camp of 100 shanty boys, for men eat terribly in the lumber woods:

Flour, per week, 6 barrels; beef, $2\frac{1}{2}$ barrels; pork, $2\frac{1}{2}$ barrels; potatoes, 8 bushels; onions, 3 bushels; pickles, $\frac{1}{2}$ barrel; sugar, 1 barrel; tea, 25 pounds; butter, 50 pounds.

These, together with prunes, dried fruit, salt, pepper, mustard, spices, sirup, sausage, meat and fresh beef, all go to spread a bounteous table.

Two great requisites go to make a lumbering job a success in addition to those mentioned above, viz.: a good cook and a good fiddler. All else may go wrong, but good grub and a good tune before turning in, smooth over the rude excrescences serving to make the toil of the woods a burden. Therefore, the cook is autocrat, *per se*, of the camp, and the fiddler first lieutenant. The cook camp is also the dining camp, where at one end two immense cook stoves are placed, and through the remaining length of the room two tables, furnished with brilliant tinware, are stationed, where a dyspeptic would faint with pure astonishment at the appetites, evolved from breathing a piny atmosphere and rolling saw-logs all day.

Yes, it is a life of toil, but also one of health. It is, virtually, kill or cure. The men are out of their bunks by four o'clock every morning. Half an hour later the horn goes for breakfast. By five o'clock, the day's work begins, and the men are at their several stations, all busy at work, long before the morning stars have finished their song. The camp force is divided into sawyers, choppers, swampers, skidders, teamsters and loaders. The choppers go ahead and cut a "nick" into a tree about four inches; the sawyers follow, and from the opposite side saw the tree down; the swampers trim off the limbs; after the sawyers have cut the trunk into log-lengths, the skidders "snake" the logs to the skids, where they are piled up twenty feet high ready for the loaders and teamsters when hauling be-

gins, to be taken to the banking ground on the adjacent river, where the spring floods start them on their final journey to the mill.

This, then, in brief, is the work from day to day, rain or shine, till the job is done. The horn blows for noon, and another inroad is made upon the commissariat; when, after fifteen minutes' rest, the work for the afternoon begins. With the close of the day, the tired men return to camp, and after supper the evening, till nine o'clock is theirs. Conversation, cards, "stag"-dancing, stories and reading fill in the time till the chore-boy turns down the light, and within ten minutes all are asleep.

This is the mere routine of camp-life, however, frequently varied by accident and death. The "Romance of the Forest" is daily acted out in the every-day life of these men. They go into the battle of the saw-logs with their lives in their hands. Not a single camp but has its tragic story of disaster, from which much of the sublime could be extracted were it the purpose of this writing. With the coming of frost and snow the work of hauling begins. The log-road is a powerful piece of civil engineering. It goes round hills, over swamps, down and up ravines, a solid mass of snow and ice, which frequently remains solidified when all things about are free from the grasp of winter. The "sprinkler" is a great institution, being a tank holding some 100 barrels of water, placed on a sled, and through the long, bitter, frosty night, it goes emptying its water on the log-road till the latter is as smooth as a toboggan-slide. This is why loads of logs measuring 15,000 feet, can be drawn by one team of horses. Once started, and the huge mass will move of its own impetus. These roads are usually so laid out that they run down hill to the banking-ground, and frequently it is all the horses can do to keep out of the way of the mass of timber they are presumed to be hauling.

Some camps take more than extra pains to make their men comfortable, and furnish the bunk camp with every possible comfort and convenience for the men. The floor is scrubbed every day, curtains are on all the bunks, every available inch of space is covered with pictures, cut-paper ornaments; the lamps, looking-glasses and combs and brushes are placed for every four men. A bird in a cage hangs over a table covered with books and papers. Cuspidors are placed conveniently for the men, and bedding is kept clean.

THE SPIRIT COUNCIL.

The weary moon resigned her reign,
And sought repose beneath the plane;
The drifting clouds crept o'er the sky
And veil'd each star with prying eye.
The perfume fairy hands distil,
Hung over April's vale and hill;
While Slumber folded in her arms,
The foes of midnight's mystic charms.

The murk grew darker by degrees,
Till o'er the land where once the trees
Stood like a phalanx to oppose
The white man's strokes, the red man's foes,
The blacken'd stumps like spectres stood,
The last sad relics of a wood.

The fox-fire stump hung out its light
And lent a weirdness to the night;
And where its phosphorescent gleam
Touch'd with a momentary sheen
Reveal'd the warriors side by side,
Rang'd in a spectral circle wide.

No marring sound the stillness broke;
The pipe led 'round the graceful smoke;
And all were eager as of old,
To hear the council's wisdom told.
To hear and bear to Land of Dreams,
The awful change in woodland scenes;
To know the white man's life or death,
In signs he holds as light as breath.
Then 'rose the Sachem's stately form,
Proud as the oak that scorns the storm.

"Can my warriors not remember,
When a forest grand and mighty,
In the fragrant moon of flowers,
In the hunter's moon of splendor
Stretch'd away where you are seated?
Surely you have not forgotten
Where the tepee's span extended;
Where the maiden's star-eyes greeted

* This poem, which very forcibly sets forth the consequence of forest-destruction, was written this report at my special request.—[A. L.

Home the warrior and the lover!
 Through that wildwood you have followed
 Trail of deer, and bear, and panther;
 And beneath the leafy cover
 Camp'd secure; and 'wake or dreaming
 Breath'd your thanks to that Great Father,
 For his care and for his kindness,
 For his bounty and your being."

"When the fire the pale-face lighted,
 In the wood we held as sacred;
 Burn'd the trees where slept our fathers,
 Then the eagle called affrighted,
 And the totem grand I cherish'd
 Sunward swept and carried with him
 All my hopes, my heart's deep secrets.
 Then my love for white man perish'd
 In the flames—Our pathway parted,
 And my eyes, with smoke clouds blinded,
 Could not see the hand of Friendship.
 On the war-trail dark I started.
 Swift my father's restless spirit
 Came to me in nights of anguish;
 And the only word it whisper'd,
 Was, 'Avenge'! and I could hear it,
 In the wild-bees' ceaseless droaning;
 In the silver voice of streamlets,
 In the panther's plaintive wailing,
 And the melancholy moaning,
 Of the night-wind chiding, calling,
 Through the forest summer, winter;
 When the trees were sprouting, budding;
 When the piebald leaves were falling."

"'Neath the white man's greed and boldness,
 We have seen the deer diminish;
 We have seen the panther leave us;
 And the hand of icy coldness
 Grasp'd our hearts and made them wither,
 Like the leaflet in the winter.
 Like the leaves our tribes were scatter'd,
 Whil'd and wasted hither, thither."

"Then the red man's land was plunder'd,
 Of the trees that gave it shelter,
 From the whistling north wind's fury.
 Though the storm-god's anger thunder'd
 And his voice grew loud and louder,
 Still the rains of summer fell not,
 Till the loam the maize had nurtur'd,
 Blew away as dry as powder.
 Still the white man knew no danger,
 Heeded not the awful warning;
 To the voice of pleading Nature,
 Still the white man was a stranger."

* * * * *

"In that Land where deer are fleetier,
 Where the arrōw never misses,
 Where the storm-cloud never gathers
 And the fruits are fairer, sweeter;
 Where the Thrush's dulcet quiver,
 Of his song is heard unceasing
 And the laughing voice of flowers
 Answers to the talking river,
 Friends shall feel a heighten'd prestige,
 When they learn the council's tidings;
 Friends shall know a joy unbounded,
 When I bear the welcome message.
 Can the hand pluck up the thistle
 And escape its bitter stinging?
 Is the warrior blind to danger
 When the poison'd arrows whistle?
 Does the white man know the power
 Nature stores to wield for vengeance?
 Can he leap beyond the danger
 When her deadly arrows shower?"

"Rings the white man's scornful laughter
 When a prophet stoops to tell him,
 In the death-blow to the woodland,
 His shall follow swiftly after.
 Now no more is heard the rapping
 Search of birds o'er trunk and branches;
 Winding worms and busy beetles,
 Now the trees' life-blood are sapping."

"Everywhere some tree is smitten
 From the sunrise to the sunset;
 On its bark, dead, curl'd and blacken'd,
 There the white man's doom is written.
 Now the streams are dry; or, shallow
 Flow polluted, voiceless, useless;
 Where luxuriance crown'd the hillocks,
 There is but a barren fallow."

"I can see a shadow casting,
 Over all the white man's country;
 I can see a sorrow coming,
 I can see revenge that's lasting."

O'er April's vale o'er April's hill
 The wavering call of the whip-poor-will,
 Like a lover's sigh it rose and fell,
 In one long lingering last farewell.
 The fox-fire vanished in the dark,
 As dies the wind-tossed taper's spark;
 The council ring was lost to view,
 And all in silence swift withdrew.

APPENDIX A.

LAWS OF THE STATE OF NEW YORK, RELATING TO FOREST FIRES.

Revised Statutes—Laws of New York (1876). [Extracts.]

FOREST FIRES.

Vol. II., p. 985, paragraph 1: "Every person negligently setting fire to his own woods, or negligently suffering a fire kindled upon his own wood or fallow land, to extend beyond his own land, shall forfeit treble damages to the party injured thereby. Every person so offending shall also be deemed guilty of a misdemeanor, and on conviction, shall be punished by fine or imprisonment, or both, at the discretion of the court; such fine not to exceed one thousand dollars, and such imprisonment not to exceed one year."

Paragraph 2: "Whenever the woods in any town shall be on fire, it shall be the duty of the justices of the peace, the supervisor, and the commissioners of highways of such town, and each of them to order such, and so many of the inhabitants of such town liable to work on the highways, and residing in the vicinity of the place where such fire shall be as they shall severally deem necessary, to repair to the place where such fire shall prevail, and there to assist in extinguishing the same, or in stopping its progress."

Paragraph 3: "If any person so ordered to repair to and assist in manner aforesaid, shall refuse or neglect to comply with any such order, he shall forfeit and pay the sum of fifty dollars, and shall also be deemed guilty of a misdemeanor, and on conviction, shall be punished by fine or imprisonment, or both, at the discretion of the court; such fine not to exceed one hundred dollars, and such imprisonment not to exceed sixty days."

Paragraph 4: "Every forfeiture recovered under the last section, shall be applied as a reward to such person or persons as the officers above mentioned, or a majority of them, shall deem best entitled thereto, for superior exertions in extinguishing or stopping the progress of such fire."

SECTION 413 OF THE PENAL CODE.

Negligence in Respect to Fires.—A person who negligently sets fire to his own woods, by means whereof the property of another is endangered, or who negligently suffers any fire upon his own land to extend beyond the limits thereof, is guilty of a misdemeanor.

SECTION 414 OF THE PENAL CODE.

Refusing to Assist in Extinguishing Fire in the Woods.—A person, who, having been lawfully ordered to repair to the place of a fire in the woods, and assist in extinguishing the same, omits, without lawful excuse, to comply with the order, is guilty of a misdemeanor, and shall forfeit the sum of fifty dollars, and be liable to fine and imprisonment."

LAWS OF NEW YORK, 1885. CHAPTER 283.

An act to establish a forest commission, and to define its powers and duties, and for the preservation of the forests.

EXTRACTS.

SECTION 9. CLAUSE 3.—It (the forest commission) shall also have charge of the public interests of the State, with regard to forests and tree-planting, and especially with reference to forest fires in every part of the State.

SECTION 20. Every supervisor of a town in this State shall be *ex officio* fire warden therein. But in towns particularly exposed to damages from forest fires, the supervisor may divide the same into two or more districts, bounded as far as may be by roads, streams of water, or dividing ridges of land or lot lines, and he may, in writing, appoint one resident citizen in each district, as district fire warden therein. A description of these districts and the names of the district fire wardens thus appointed, shall be recorded in the office of town clerk. The supervisor may also cause a map of the fire districts of his town to be posted in some public place, with the names of the district fire wardens appointed. The cost of such map, not exceeding five dollars, may be made a town charge, and the services of the fire wardens shall also be deemed a town charge; and shall not exceed the sum of two dollars per day for the time actually employed. Within the counties mentioned in section seven of this act,² such persons shall be fire wardens, as may, from time to time be appointed by the forest commission. The persons so appointed shall act during the pleasure of the forest commission; and there be applicable to them all the provisions of this act, with reference to supervisors and district town wardens. Upon the discovery of a forest fire, it shall be the duty of the fire warden of the district, town or county, to take such measures as may be necessary for its extinction. For this purpose he shall have authority to call upon any person in the territory in which he acts, for assistance, and any person shall be liable to a fine of not less than five nor more than twenty dollars for refusing to act when so called upon.

SECTION 21. The forest commission, the forest warden, the forest inspector, the foresters, and any other person employed by or under the authority of the forest commission, and who may be authorized by the commission to assume such duty, shall, within the counties² mentioned in section seven of this act, whenever the woods in any such town shall be on fire, perform the duty imposed upon, and in such case shall have the powers granted to the justices of the peace, the supervisors and the commissioners of highways of such town by title fourteen of chapter twenty of part one of the Revised Statutes, with reference to the ordering of persons to assist in extinguishing fires or stopping their progress; and any person so ordered by the forest commission, the forest warden, the forest inspectors, the foresters, or any of them, or any other person acting or authorized as aforesaid who shall refuse or neglect to comply with any such order, shall be liable to the punishment prescribed by the said title.

SECTION 22. No action for trespass shall be brought by any owner of land for entry made upon his premises by persons going to assist in extinguishing a forest fire, although it may not be upon his land.

SECTION 23. The fire wardens, or the supervisor, where acting in general charge, may set fences to be destroyed or furrows to be plowed to check the running of fires, and in cases of great danger, back-fires may be set along the road or stream, or other line of defense, to clear off the combustible material before an advancing fire.

SEC. 7.—All the lands now owned or which may hereafter be acquired by the State of New York, in the counties of Clinton, excepting the towns of Altona and Dannemora, Essex, Franklin, Hamilton, Herkimer, Lewis, Saratoga, St. Lawrence, Warren, Washington, Greene, Ulster, Sullivan, shall constitute and be known as the forest preserve.

SECTION 24. The supervisor of every town in which he is a fire-warden as aforesaid, and in which a forest-fire of more than one acre, in extent has occurred within a year, shall report to the forest commission the extent of area burned over, to the best of his information, together with the probable amount of property destroyed, specifying the value of timber, as near as may be, and amount of cord-wood, logs, bark or other forest product, and of fencing, bridges and buildings that have been burned. He shall also make inquiries and report as to the causes of these fires, if they can be ascertained, and as to the measures employed and found most effectual in checking their progress. A consolidated summary of these returns by counties, and of the information as to the same matter otherwise gathered by the forest commission, shall be included in the annual report of the forest commission.

SECTION 25. Every railroad company whose road passes through waste or forest lands, or lands liable to be overrun by fires within this State, shall twice in each year cut and burn off or remove from its right of way all grass, brush, or inflammable material, but under proper care, and at times when the fires thus set are not liable to spread beyond control.

SECTION 26. All locomotives which shall be run through forest-lands shall be provided, within one year from the date of this act, with approved and sufficient arrangements for preventing the escape of fire from their furnace or ash-pan, and netting of steel or iron wire upon their smoke-stack to check the escape of sparks of fire. It shall be the duty of every engineer and fireman employed upon a locomotive to see that the appliances for the prevention of the escape of fire are in use and applied, as far as it can be reasonably and possibly done.

SECTION 27. No railroad company shall permit its employes to deposit fire coals or ashes upon their track in the immediate vicinity of woodlands, or lands liable to be overrun by fires, and in all cases where any engineers, conductor or trainmen that fences along the right of way, on woodlands adjacent to the railroad, are burning, or in danger from fire, it shall be their duty to report the same at their next stopping place, and the person in charge of such station shall take prompt measures for extinguishing such fires.

SECTION 28. In seasons of drought, and especially during the first dry time in the spring, after the snows have gone, and before vegetation has revived, railroad companies shall employ a sufficient additional number of trackmen for the prompt extinguishment of fires. And where a forest fire is raging near the line of their road they shall concentrate such help and adopt such measures as shall most effectually arrest their progress.

SECTION 29. Any railroad company violating the provisions or requirements of this act shall be liable to a fine of one hundred dollars for each offense.

SECTION 30. The forest commission shall, with as little delay as practicable, cause rules for the prevention and suppression of forest fires to be printed for posting in school-houses, inns, saw-mills, and other wood-working establishments, lumber camps and other places, in such portions of the State as they may deem necessary. Any person maliciously or wantonly defacing or destroying such notices shall be liable to a fine of five dollars. It shall be the duty of forest agents, supervisors and school trustees, to cause these rules, when received by them, to be properly posted, and replaced when lost or destroyed.

SECTION 30. Any person who shall willfully or negligently set fire to, or assist another to set fire to, any waste or forest lands belonging to the State, or to another person, whereby the said forests are injured or endangered, or who suffers any fire upon his own to escape or extend beyond the limits thereof, to the injury of the woodlands of another, or of the State, shall be liable to a fine of not less than fifty dollars, nor more than five hundred dollars, or to imprisonment of not less than thirty days, nor more than six months. shall also be liable in an action for all damages that may be caused by such fires; such tion to be brought in any court of this State, having jurisdiction thereof.

The act, from which the above extracts relating to forest fires taken, was passed by *The People of the State of New York, represented in Senate and Assembly, May 15, 1885.*

On April 30, 1886, The Forest Commission of the State of New York passed the following

RULES AND REGULATIONS:

First. All persons having occasion to light a fire for burning a fallow, or for purposes of clearing or improvement, shall give five days' notice of such intention to the nearest fire warden. He shall also give notice to all owners or occupants of adjoining lands, at least forty-eight hours previous to setting such fires, and these fires will be permitted only when the wind is favorable. Competent persons must remain on guard until the fire is completely extinguished, and no such fires will be allowed until the trees are covered with mature foliage.

Second. Besides the fires specified in the foregoing rules, fires are permitted in or near the forest for cooking, warmth and insect smudges, but all other fires are absolutely prohibited. Persons kindling a fire for any of the purposes herein mentioned, are directed to clear away all combustible material for the space of six feet around the place where it is about to be kindled, and to thoroughly extinguish the fire before leaving the neighborhood, either temporarily or permanently.

Third. Hunters, in the use of fire-arms, are hereby cautioned against allowing fires to start from such cause. Smokers are also reminded of the danger to the forest from their carelessness, and all persons are hereby warned that any damage or injury to the forest which may be caused by their acts or omissions, will be deemed to result from their culpable carelessness.

APPENDIX B.

LAW OF THE STATE OF MICHIGAN RELATING TO FOREST-FIRE.*

FIRING OF WOODS AND PRAIRIES.

§ 9402. Sec. 1. Every person who shall willfully or negligently permit any fire to pass from his own woods, prairies, or grounds, to the injury or destruction of the property of any other person, shall be deemed guilty of a misdemeanor, and on conviction thereof, shall be punished by a fine not exceeding one thousand dollars, or by imprisonment in the county jail not exceeding one year, or both, in the discretion of the court; and shall also be liable to the party injured in double the amount of damages sustained.

§ 9403. Sec. 2. Whenever the woods or prairies in any township shall be on fire, so as to endanger property, it shall be the duty of the justices of the peace, the supervisor and the commissioners of highways of such township, and each of them, to order such, and so many of the inhabitants of such township, liable to work on the highways, and residing in the vicinity of the place where such fire shall prevail, and there to assist in extinguishing the same or in stopping its progress.

§ 9404. Sec. 3. If any person shall refuse or willfully neglect to comply with such order, he shall forfeit a sum of not less than five nor more than fifty dollars.

LAWS OF MICHIGAN RELATING TO ROADSIDE TREE-PLANTS.†

SHADE TREES IN HIGHWAYS.

§ 1408. Sec. 1. Shade trees shall be planted along both sides of the public highways, at the uniform distance as near as may be, of sixty feet apart, and not less than twenty-three nor more than twenty-five feet from the center line of the highway, but the township board of any township may direct as to the distance which trees may be set from each other or from the outer line of the highway. All trees now growing upon the sides of any highway, and all trees that may hereafter be planted thereon, standing more than sixty feet apart, shall be preserved and shall not be injured or removed, unless by the direction of the commissioner of highways, and with the consent of the owner of the adjoining land, unless such trees shall interfere with or obstruct the travel on the highway. Provided, that the provisions of this chapter, in whole or in part, shall not be deemed mandatory in townships in which the electors may, by vote, at a township meeting, thus determine.

§ 1409. Sec. 2. Any person planting trees along the highway adjacent to property owned or occupied by such person, shall be entitled to be credited twenty-five cents upon his highway tax for every tree so planted, but not to exceed in the aggregate twenty-five per cent. of such person's highway tax in any year.

§ 1410. Sec. 3. In road districts where there are not trees planted and growing along the highways to the extent required by the first section of this chapter, the commissioners shall require that at least fifty trees per year be so planted in each district, and shall co-

* First report of the Forest Commission of the State of Michigan, 1888, p. 88.

† First report of the Michigan Forestry Commission, 1888, p. 80.

tinue to require the same from year to year, until every highway in his township where the adjoining lands are cleared, is supplied with shade-trees, as contemplated by said first section, but not more than twenty-five per cent. of the highway tax shall be appropriated for such purpose in any one district in any one year. The overseers, acting under the direction of the commissioner, may require twenty-five per cent. of the highway tax of any person in any year, to be paid in money, the same to be applied in planting shade-trees along the highway adjoining the property of such person. The overseer shall particularly attend to the planting of such trees, and shall allow no unsuitable tree, nor any tree wanting sufficient roots or vitality to be planted, and he shall have the charge of and the care for the same in the best manner for their growth.

POWERS OF COUNCIL.

§ 2867. Sec. 2. The council may provide for and regulate the planting of shade and ornamental trees in the public highways, streets and avenues of the village, and for the protection thereof.

PLANTING AND PROTECTING TREES IN VILLAGES.

§ 3065. Sec. 1. *The people of the State of Michigan enact*, That it shall be lawful for the street commissioners of any incorporated village, upon the written application of any six freeholders of such incorporated village, to grant permission to the said freeholders, or any one of them, to plant in any of the public streets, lanes or highways of such village, contiguous to property owned by any of the freeholders making such application, shade or ornamental trees, and to provide suitable protection for, and around any shade or ornamental trees now growing, or hereafter planted within such village: Provided, that nothing herein contained, shall authorize such street commissioners to grant permission to any person to plant trees in violation of any ordinance of such village.

§ 3066. Sec. 2. Such permission may be made by such street commissioners, in writing, and may be filed by the party or parties receiving it, in the office of the clerk of such village; and after the said permission shall have been so filed, it shall not be lawful for any person to cut down, mutilate or destroy said trees, so long as they are alive and growing, under the same penalties which would attach to persons guilty of mutilating or destroying trees growing within an enclosure or occupied premises.

§ 3067. Sec. 3. It shall not be lawful for any person to cut down, mutilate or destroy shade or ornamental trees that have been standing in any highway, public park, street, lane or alley of such village, for the period of five years previous to the passage of this act, so long as said trees are alive or growing, or any shade or ornamental trees which have been heretofore planted, or to cut down, mutilate or destroy the protections placed around any shade or ornamental trees; and any person who shall willfully and maliciously violate the provisions of this act, shall be punished by a fine not exceeding twenty-five dollars, or by imprisonment in the county jail not more than sixty days.

AN ACT

Of the Legislature of Maine to establish Arbor Day.

SECTION 1. That the Governor shall annually set apart a day in the spring as Arbor Day, and shall issue a proclamation recommending that it be observed, by the people of the State in the planting of trees, shrubs and vines in the adornment of public and private grounds, places and ways, and in such other efforts and undertakings, as shall be in harmony with the general character of a day so established.

SECTION 2. This act shall take effect when approved.

Approved March 10, 1887.

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